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Theory of Osteopathy

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TO

Those who would find in the natural arrangement of the various parts of the human body the source of perfect order, harmony and health this volume is respectfully dedicated by

THE AUTHOR

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PREFACE.

IN THE preparation of this volume the author has freely drawn from the rich store of anatomical and physiological facts which are a part of general science. For this he makes no attempt to give credit save in a general way.

He has read the following works — On anatomy: Allen, Gray, Gerrish, Morris and Quain. On physiology: The American Text Book, Dalton, Flint, Foster, Stewart and Landois & Stirling. On Osteopathy he has read with profit the works of the distinguished founder, Dr. A. T. Still, Dr. Chas. Hazzard, Dr. C. P. McConnell, Dr. A. P. Davis and Dr. Henry. Miscellaneous: Ranney's Applied Anatomy of the Nervous System, Ranney's Diseases of the Nervous System, Hilton's Rest and Pain, Holden's Landmarks, Robinson's Abdominal Brain. On examination and diagnosis: Page, Vierordt, Corwin, Hare, and Cohen and Eshner. Osler's Practice of Medicine, Hughes'

Practice of Medicine, American Text Books of Medicine, Surgery, Obstetrics, Gynecology. On Massage the author has read with pleasure and profit the works of Taylor and Dowse.

To the many Osteopaths with whom he has been associated the author would say, "I am a part of all that I have met," and whatever of merit may be found within this volume is, in a measure, due to those with whom he has so fortunately come in contact.

The author is deeply indebted to Dr. J. W. Hofsess and to Captain Dwight H. Kelton, for many valuable criticisms and corrections while the work was passing through the press.

INTRODUCTION.

"OF MAKING many books there is no end" was a truth three thousand years ago: it is eminently true at the present time. There is nothing which so interests the human race as does an advance in the method of restoring to health a diseased body. That the administration of drugs has been empirical and that the knowledge of their effects has been bought at a great price is well known, but tradition still fetters the progress of the healing art.

Aught which differs from the fixed order of belief as recognized by the profession, is condemned in advance and must run the gauntlet of criticism and opposition. To elucidate a method of healing which is based upon known facts of science is certainly a gratifying task. There is no fact of anatomy which may not be of value to the osteopathic physician. He uses all anatomical connections and relations. He must be a bloodless surgeon, whose scalpel never punctures the skin, nor sections the nerve, nor severs the tendon. His knowledge of anatomy must be

minute and profound, to the end that he may diagnose diseased conditions though far removed from the functional lesion.

"Despise not the day of little things" is a text which the osteopathic practitioner should embody into his code of morals for daily repetition. The minute nerve twig extending from spine to distant organ or viscus, unimportant in size, is pregnant with suggestions of the cause of the disturbed function. But, while a knowledge of anatomy is essential to the thoroughly equipped practitioner, he must likewise be master of the known facts of physiology; it is not enough that the osteopathic physician be able to foretell from the location of the lesion the viscus which is affected; he must be able to predicate the *nature* of the disturbed function and its general result upon the health of the patient.

There can be no pathological changes in a tissue or organ which are not accompanied by disturbances in the metabolism of the part, and metabolism is wholly dependent upon the conditions of nutrition and nerve supply.

Osteopathy is a protest against the growing practice of taking drugs. It offers a more rational means and bases its promises of cure upon the fact that in a healthy organism in perfect repair there is no pain, no

weakness, no disorder, and no disease. The laws of nature are immutable. Water flows in sparkling streams from mountain springs to the distant ocean in obedience to these laws. The woody fibres of the massive tree have been raised high in the air obedient to these same forces.

The science of Osteopathy has magnified the importance of the spine as a guide in diagnosis, basing such diagnosis upon the well-known physiological law of transferred sensation, and the anatomical connection between spine and viscus. From this fact comes our accuracy in diagnosis, an accuracy which is based upon mathematical calculation and cannot fail. The variations which occur in the relations and structure of different parts of the organism sometimes produce embarrassing results to the surgeon and fatal ones to the patient. These variations are rarely sufficient to embarrass the osteopath, though he must ever be ready to correct errors in diagnosis due to variations in position of lesion, by examination of the viscus affected.

Every method of examination known to the medical world must be utilized to correct and to prove the accuracy of the strictly osteopathic diagnosis.

The term lesion is used in osteopathy in a free sense as a cause of disease, but it is *not* restricted in

its meaning to osseous dislocations. That there are spinal lesions associated with the great majority of diseases is a fact to which every osteopathist can certify. In many cases these are the causes of the diseased conditions; in many others they are the direct results, yet, as sequelæ, serving to prolong the disease.

The science of Osteopathy is progressive. It makes a distinct advance in the art of healing. It demands no external aid but recognizes in man the power to successfully militate against the adverse conditions in which he is placed. There is no hypnotic so conducive to restful sleep as an equalized nerve force, no stimulant so effective as a perfect circulation, no reaction so natural as that rest which follows physiological action. The blood is the life. The nerve controls the condition and distribution of the blood. The science rests upon the truth that *pure blood* and normal nerve supply give health. The arrangement of the other tissues of the body are for and to this end.

This science marks a new departure in three things pertaining to diseased conditions, viz.: etiology, diagnosis and treatment.

There is no authority in etiology save anatomy and physiology. The symptoms elicited and observed are but the logical results of some interference with

physiological function. Most of the facts upon which Osteopathy rests are the common possession of the medical world; but the classification of these facts have given shape and system to the science. The resistant and recuperative powers of the body are being demonstrated. Order, perfect order, in the human frame results in a perfect performance of all the duties of that organism. The curve of the muscle, the glow of the skin, the gleam of the eye, all betoken a perfect adaptability, an undisturbed motion of fluids, a condition called health.

The science of Osteopathy is an exact one. The symptoms point the lesion; the location and kind of lesion suggest the treatment; its correction results in a restoration to health.

The osteopathic physician finds no force outside the body which will maintain health or life. He trusts to liberating and equalizing the forces of the organism through the movements of the fluids. Motion is essential that the matter of the body may manifest itself; and this manifestation is life.

External forces produce a powerful and continuous effect upon the central nervous system. These influences reach the center through the various afferent pathways, either consciously or unconsciously contributing to life. The function of the air, the sunlight,

temperature, meteorological conditions; these and many other forces contribute to one general state of health. It is upon this view that we seek to restore health by changing the nature, quality and amount of these forces.

Passive movement has certain curative value. Motion may have been diminished; this decrease of motion may lead to a loss of afferent impulses from the surrounding parts and thus to a diminution of physiological processes. The science of Osteopathy is entitled to separate, careful, special investigation, whereby its facts and principles may be recognized at their true therapeutic value.

This method has the broadest affiliations with general science, resting upon all known truths of physiology, and in harmony with each.

CHAPTER I.

HEALTH AND DISEASE.

Relation between mind and body.

"MENS SANA IN CORPORE SANO" is an old Latin aphorism of which Rousseau, the great French savant and philosopher, remarked that it is a short but complete description of a perfect state in this world. These conditions assumed, all other earthly conditions are attainable. All things are possible to the fearless, perfect soul; and fearlessness comes only as an attribute of a perfect mental and physical condition. The body and mind are intro-active. The mind rules the body, yet the body in turn reacts most profoundly upon the mind. Bodily health, perfect bodily condition, insures mental health. Health is the end of all therapeutics. It represents the natural condition. It is not an end of life but a means to perfect living. Health may be defined as that condition of the organism which pertains when every organ is perfectly adapted to perform the function for which it was designed. Nor is this condition

Health is a birthright.

of health unattainable — in fact, it is or should be the heritage of everyone — a universal birthright. To this end every child that is born has a right to demand that it come of healthy parentage—that weakness and pallor and disease should not propagate their kind, that health may be a universal possession of the dominant races. When that time has come then will the profession of physician become a thing of the past, since the knowledge which he possesses as expert, or professional attainments, will then have become general knowledge — a part of the common possessions of mankind. Then children will remain unborn from diseased parentage; then those who are born will develop to that growth and strength which is their right, as does the twig grow into the tree or the young of the untamed animals reach their maturity, unhampered by pain, untouched by disease. There will come a race with nerves unracked by pain, which have never yielded to the seductive effects of the deadly anodynes. Then strength will be the glory of man and woman, and weakness and sickness a disgrace. That day will see men whose biceps measure will exceed that of the neck; and wasp-waisted women will be a tale that is told — a tradition of the barbarous past. This condition is typified in Longfellow's "Village Blacksmith"—

The health of the coming ages.

"The smith, a mighty man is he,
With large and sinewy hands,
And the muscles of his brawny arms
Are strong as iron bands."

Carelessness causes disease.

To maintain this state and to restore it if lost, has been the object of all systems of therapeutics. Carelessness, a trait of the race, has caused man to disregard prophylaxis and to trust more and more to what are considered as curative agents. So long as there is no noticeable deviation from the usual condition of ease, comfort and strength, just so long will the body receive no thought. Health is modest, retiring. Subjectively it is unobtrusive and calls for no thought. Objectively it is prominent and commands attention. 'Tis the condition which excites the admiration of all; the envy of those who have been so unfortunate as to lose it, for health is a jewel unesteemed till lost, but once lost not all the wealth of Golconda can replace it. Longfellow says, "Life without health is a burden; with health is a joy and gladness." Empedocles delivered the people of Selinus from a plague by draining a marsh and was deified and a coin was struck in his honor. But simple as may seem this condition, there is necessary a great amount of care in order that the organism may be maintained in proper working order. It may seem strange to say that health is so difficult to maintain,

but when we think of the manifold intricacies of the structure of our bodies, the wonder rather seems that we are able to maintain so nearly a perfect condition of the body as exists in the majority of persons. There is such an interdependence between the various organs each of which contributes to the welfare of the other that the disarrangement of a single one will lead to the disarrangement of the whole. There exists the various systems, nervous, circulatory, respiratory, muscular, osseous, etc., so perfectly related that the one cannot be at all disturbed in form or in function without profoundly affecting each of the others. These systems interact normally so as to produce the physiological functions of all; if a disturbance either primarily or secondarily reaches the nervous system and through it various other subordinate systems, soon harmony, order and health have disappeared.

The interdependence of the various organs.

Diet must play an important part in the health of each community and each individual. The vitality, the resistance of the body can be maintained only by a dietary affording the proper amount of each of the three great classes of alimentary principles,—carbohydrates, proteids and fats. But even here the personal desires and idiosyncrasies of the patient must largely determine the particular form under which each class shall be taken. To be productive of the

Vitality maintained by diet.

highest good, the food should be palatable. Enjoyment and appetite are the best digestives.

Details of hygiene important.

All hygienic knowledge should be rigorously applied in the treatment of disease. Sunshine, pure air, ventilation, exercise and diet all are essential in prophylaxis and in the cure. In maintaining his own health or in advising others to the same end, the osteopath should never forget these minor details which are known, and have been proven in many instances to be life saving. "Prove all things; hold fast that which is good." Exercise, outdoor air, light, well ventilated living and sleeping rooms and one-third of each twenty-four hours given to sleep will surely contribute to health, mentality and virtue.

Life compared to a whirlpool.

Disease is the reversed condition. It represents a change in the normal metabolic processes. Health is maintained by a proper and perfect metabolism. Into the ceaseless vortex certain substances are continually entering, losing their identity and momentarily contributing to the whirlpool, lending energy to draw in other particles. By this intussusception, life is manifested, certain low grade products of oxidation are formed, energy is freed. This regular interchange from the organic, through the living maelstrom to the lower organic and to the inorganic, constitutes health. Within certain limits the rate of change and the products may

vary without seriously disturbing the functioning of the organs, but should the rate of change be markedly interrupted, then may biproducts be formed which the depurative organs are not able to withdraw, suboxides are formed and these acting as toxins interfere with the harmony of the organism, producing disease. Disease (from *dis* — not ; and *ease* — a state of rest) is defined as that state or condition of the body which is marked by an inharmonious action of one or more of its organs, due either to abnormal conditions or structural change. The causes of these conditions are usually considered as *exciting* or the immediately conditioning factor, and *predisposing* or that which tends to the development of the condition. These two may be further subdivided and may be so interrelated that a strict differentiation is not always possible. They act together in a majority of cases confusing etiology of diseases and puzzling the diagnostician. True, in many cases there is a *causa causans*, or the causing cause, which is the essential predetermining factor. This is in many cases so evident that the secondary causes are apt to be overlooked. In addition to the foregoing causes of disease there are the ordinary causes, such as change in temperature, seasonal and climatic variation, altitude, etc., to which all persons are more or less exposed and against which the

Biproducts of retarded metabolism produce disease.

Causes of disease.

resisting power of the individual is ordinarily sufficient protection.

Classifying causes of diseases as *internal* and *external*, we have the following:

Causes acting from within:

I. Predisposing
   1. Heredity — Parents to offspring, transmitting either disease or a tendency to disease.
   2. Individual peculiarities not inherited — connate and acquired.

II. Mental and emotional causes.

III. Structural lesions — secondary to or resulting from any of the above.

IV. Abnormal blood supply.

V. Altered nerve influence.

Causes from without:

I. Physical or mechanical, producing structural or relational lesions.

II. Chemical — substances coming in contact with the organism producing abnormal metabolism.

III. Micro-organisms.

Conditions not always controlled.

Many times is disease produced by conditions which are known to be dangerous but which cannot be avoided. Man constantly chooses occupations

which are productive of disease or resides in a locality known to be prejudicial to health. We feel that there are other occupations in which health would be ours in greater measure, but fitness, desire, etc., impel us to an occupation in which we draw heavily and continually upon our vital capital. Health is a means to an end, and in insuring it, by residence, occupation, care of the body, etc., there is a limit to the amount of premium that one can pay. Even life itself may be too dearly bought and death with duty is to be preferred to life with dishonor, cowardice and shame. The question comes to all, what can I afford to pay for health? Each must answer for himself. The teacher in the schoolroom follows day after day an occupation that she knows is taking her life and strength. The shop girl hour after hour and month after month works for a miserable pittance and stands at her counter because she knows that every occupation in life is crowded and she holds with the tenacity of hopelessness and fear to the only means of subsistence which she possesses.

But to discuss the causes of disease. Of the predisposing causes of disease, the most important are those connected with some peculiarities of the bodily structure which may be (1) inherited, or (2) congenital but not inherited, or (3) acquired after birth.

Germs not usually transmitted in hereditary diseases.

In the so-called hereditary diseases it is not the disease itself nor its direct specific cause which is transmitted from parent to child, but some peculiarity of structure of tissue or organ which in the course of development makes the person peculiarly susceptible to disease or to causes which produce the disease. These may be, either forces acting from without, or else the peculiarity produces disorder itself either by excess or defect of structure or function. Very few diseases may be transmitted directly *in utero*, but of this number are syphilis, small-pox and a few others. The belief that the specific germ of tuberculosis and scrofula is never transmitted but that inheritance gives a peculiar susceptibility to the disease owing to weakened resistance on the part of the protoplasm, is now prevalent though not proven.

Immunity by heredity.

Heredity plays a part in immunity just as it does in liability to disease. This is seen not only in the family but on a broad scale among races. Perhaps this even may be due to their obedience to or neglect of certain laws of health. But certain it is that the negro of the southern states is almost immune against cancer and in his African home is free from syphilis, though in America is peculiarly subject to this disease. He is peculiarly liable to tuberculosis and immune to malaria.

Lesions, primary and secondary, causes of disease.

The term lesion as used in this work includes any deviation from the normal either in structure, relation or function. It may be either a *causa causans*, or it may act as an exciting cause of disease either with predisposing causes or with other causes from without. In other words, lesions, as the term is used by osteopaths, may be either primary or secondary. The division is self explanatory. The term primary lesion is ordinarily restricted to conditions which produce disease; hence, causative. The term secondary lesion is applied to such as are the result of diseased conditions. These lesions are sequelæ of previous diseases, yet may be causes of present pathological conditions. The osteopath seeks for his lesions along the spine and considers them either in the light of causes of disease or of evidences of a diseased conditions of the organ.

These lesions along the spine may vary in kind and in degree. The effect is not infrequently disproportionate to the amount of the lesion, sometimes the least detectable variation from the normal may produce the most pronounced and widespread effects. On the other hand the spine is sometimes so distorted that one would expect a marked interruption to all the processes of life, yet no such disturbance results.

These spinal lesions may be of any of the following types or more likely a combination of some two of them :

1. *Osseous.*—This may be so pronounced as to be a dislocation, or so slight as to be called a subluxation

How osseous lesions produce disease.

In either case there may be an interruption to the free passage of nervous impulses which stream continually from viscus to center over the afferent nerve fibres entering the cerebro-spinal system, or from center to viscus over the efferent nerve fibres which also pass through the spinal and cranial foramina. These nerves serve as channels for all communication between viscera and center; these bind the parts together into a harmonious whole; these establish equipoise and health. Every viscus, muscle and tissue of the body is governed by impulses from the centers passing through these foramina or through corresponding openings in the base of the cranium. Likewise through these go all those impulses which reach the centers from the sensorium. Sensations of ease, muscular sense, pressure, temperature, blood pressure, vaso-motor condition, touch, all pass through these channels. How rational that any change in these co-apting surfaces should disturb the equilibrium between the incoming and the outgoing impulses; this disturbance leads to a failure of some one or more

of the viscera to function normally, disease being the necessary result. Osseous lesions are usually primary causes of disease and diseased conditions, though muscular contractions in convulsions, in rheumatism, and in other diseases may produce actual dislocation of many of the strongest articulations of the body; so, too, these and other causes may lead to slight subluxation of rib or vertebra which in turn may affect some organ. This effect may be deferred or immediate. This serves to explain many of the sequelæ of diseases which otherwise are inexplicable.

Osseous lesions, primary and secondary.

2. *Muscular.*—Aside from osseous lesions the next most productive of disease is muscular. This is usually a result of some abnormal condition, some irritation to its motor nerve, resulting in its contraction, hyperæmia, and hyperesthesia. This condition acting reflexly may irritate the nerves to the viscera, there affecting sensory and vaso-motor conditions. Thus the muscular contraction, itself a result, may serve as a cause for the continued disturbed condition in acute diseases; its removal is followed by an amelioration of the conditions. These muscular lesions may result from strains, overwork, exposure to cold, drafts, etc.

Muscular lesions effect nerves reflexly.

3. *Ligamentous.*—The third kind may be classed as lesions of connective tissue, or ligamentous. The

muscular lesion always exists with the osseous at the beginning. It may exist independent of it but in either case a continual contraction of a muscle means a hyperæmia, venous stasis and retrograde metabolism, namely,— an increase in the connective tissue wrappings of the muscle, tightening and thickening the ligaments and tendons and thus pressing upon the channels for blood, lymph and nerve impulse. This will explain why the osteopath attributes so many diseased conditions to lesions; not lesions in the narrow sense of dislocation, but in the sense of any abnormality of structure. Their correction leads in most cases to a cure; in all cases the immediate result is to palliate the condition. The correction of these lesions is the removal of the cause in many diseased conditions. In bacterial diseases even this treatment produces effects which tend to cure by sending more and purer blood to the organ, increasing the activity of assimilative and depurative tissues, increasing the vitality and strength of the patient.

Increase of connective tissue interferes with nutrition.

Correction of lesions produce cure.

It seems to be an established belief, at best it is a prevalent one, that in all things the medical man and the osteopath must be on opposing sides of every question; and should the opposition by priority have occupied the only tenable position it is necessary that the osteopath should occupy any position, however

untenable, rather than stand in the same position as his medical friends. This need not be. The belief in the existence of lesions as a cause of disease has led to a very conservative estimate among osteopaths as to the functions of bacteria found in the body. The discrepancy between the explanation of the causes of disease from the view-point of the bacteriologist and that of the osteopath is apparent only, for there is no necessary conflict. The osteopath acknowledges that inorganic and non-living poisons introduced into the system may cause disease and death, and why not acknowledge, too, that organisms whose rate of increase is almost unbelievable and the virulence of whose products is scarcely equaled by that of common poisons may not produce like effects? No one, for a moment, claims that carbolic acid or some of the compounds of lead may not be the real cause of diseased conditions if introduced into the body,—though no one forgets that the resisting power of some individuals is greater than that of others.

No conflict between Osteopathy and the germ theory.

The history of the growth of the idea that micro-organisms are the cause of many of the diseases that flesh is heir to, is an interesting one. It entails the idea of spontaneous generation. The discussions which led to the positions occupied by scientists began before the Christian era. All the ancients believed in

spontaneous generation. Dead bodies decaying became bees, hornets, flies, worms and beetles. Animals were held to develop from moisture. Aristotle asserts that sometimes animals are found in putrefying soil, in plants and in the fluids of other animals. He announces that every substance which has become moist and every moist body that has become dry, produces living creatures, provided it is fit to nourish them. Two thousand years later this same belief prevailed, extending downward through the middle ages, and incidentally contributing to the science of bacteriology.

In 1668 Francesco Redi, expressed a belief, seemingly the first to do so, that maggots formed in decaying meats did not arise *de novo*, but were a progeny of the flies which swarmed upon it. His proof of his position is historic. Covering jars containing the meat with paper, and later with gauze, he showed that the flies deposited their eggs on the covering, while the meat decayed as usual.

It was at this time that Leuwenhock (1675) perfected the compound microscope to such a degree as to make it of some service. By the power of the lens life was revealed which before had been but dimly guessed at. The doctrine of spontaneous generation again fought for recognition, while Plençig of Vienna

Plenciz first suggested germ theory.

for the first time, in 1762, announced *a connection between the organic life revealed by the microscope and the origin of disease.* This idea was for a long time neglected, but other experiments were carried on which led to the present position of scientists. The doctrine of spontaneous generation was finally overturned by a series of brilliant experiments, beginning with Spallanzani, who subjected sealed flasks with infusorial fluids to the temperature of boiling water and got no evidence of life; Schultze, who heated flasks and passed air through sulphuric acid into them daily with no evidence of life, made a vast step forward in 1836; while Schwann proved that calcined air admitted to putrescible liquids did not produce life. Pasteur demonstrated that meat did not decay if kept free from germs.

Tyndall's experiment.

The crucial test for spontaneous generation was made by John Tyndall. He arranged an air-tight box with glass ends in such a manner that test tubes introduced into the bottom could be filled without communication from the outside. Waiting until a ray of light passed through the box from end to end made no illumination, indicating that all the dust of the air had settled to the bottom or had adhered to the sides which were oiled; the test tubes were then filled with such mixtures as had

under ordinary circumstances been known to soon become swarming with bacteria of putrefaction. The mixtures were then heated to the boiling point and allowed to stand for a few days, when they were heated again. By this method of repeatedly raising to a high temperature and allowing it to cool to a temperature at which development of bacteria would take place he hoped to thus overcome the condition which he had conceived to be the cause of the failure of other experiments of a similar nature.

His idea was that the *spores* have a greater resistance to the action of heat than the fully developed germs, and that they had withstood the tests of other investigators, but by successive heatings he hoped to destroy them in their developing or in their matured state. The plan proved successful and it was demonstrated most conclusively that life does not originate *de novo*. The tubes stood for months with no evidence of life or decomposition. This experiment proved, with others of a similar nature, that decomposition does not take place except it be associated with the action of certain microscopic organisms.

Life does not originate de novo.

Tyndall's remarkable experiment finally overthrew the doctrine of spontaneous generation. The necessary data were now established for carrying out the

crucial tests to which the germ theory was subjected before it was accepted.

These tests put in common language were as follows:

Koch's test.

The disease must be one that can be clearly identified. The specific germ must in all cases be capable of being isolated. It must be present in the diseased tissue or organ and not merely in the fluids associated with the organ. It must be capable of being reared in pure cultures and lastly when germs from these pure cultures are introduced into the system of an otherwise healthy animal, the introduction must be followed by a disease having the same symptoms as the original disease. The test made in numbers of cases has established the germ theory as a scientific fact. It places the germs as a cause of disease this far, that, without the introduction of the germs the disease would not have occurred. The osteopath regards the germ as an *exciting* cause of disease. He considers the resisting power of the body an important factor in prophylaxis. This power depends upon the condition of the blood; and it is thus through the blood that the osteopath seeks to militate against development and effects of the pathogenic germs. The osteopath practices asepsis and antisepsis. He contends that the best germicide is good red blood, and

Red blood as a germicide.

acknowledges that drugging is *theoretically* the method of killing the germ. The only difficulty comes in finding a drug that will reach the bacterium. Unfortunately, when drugs are administered, the patient yields to the effect of the poison before the germ is killed.

There is no longer any discussion among intelligent men as to whether certain forms of germs are dangerous and destructive to life; but how to prevent their entrance and to combat their ravages when once entered are the great questions for the physician.

Definition of bacteria.

A *bacterium* may be defined as a minute vegetable cell. Its component substance is called myco-protein. Its chemical nature has never been absolutely determined. For convenience of study those which produce diseased conditions are divided into three classes.

First. The cocci, which are spherical in form, either existing as single spores, micro-cocci; or united in pairs, diplo-cocci; or arranged in chains, strepto-cocci; or in clusters or groups, when they are called staphylo-cocci.

Second. The bacillus whose form is more or less rod shaped.

Third. The spirilum having a cork-screw or spiral form.

Experiments have shown these to be present in profusion in most places, yet they do not occur in the atmosphere over the ocean very far from land, at the tops of mountains nor normally in the tissues of the body. They follow the law of the universe in that each produces its kind, although under certain conditions it seems that their products may vary.

The term *bacteria* is used to include only vegetable organisms. *Micro-organisms* may mean either vegetable or animal organisms, though but few of the protozoa are pathogenic.

Of the multitude of bacteria there are perhaps less than twenty that are deleterious to the system while there are numbers and numbers absolutely necessary to life.

As to their size they are about $\frac{1}{25,000}$ of an inch in diameter. Their process of development is rapid as is their rate of multiplication. Cohn calculated that the weight of a single germ is $\frac{1}{10,000,000,000}$ of a milligram, yet under ideal conditions they multiply so rapidly that in three days a single germ may have reached the astounding mass of 7,500 tons, its progeny numbering 5,000,000,000,000. So marked is their absence from the normal tissues of the body that their presence there is always taken as a certain evidence of disease. That under certain conditions they enter the

Rapidity of development.

tissues of the body and exist within them is not denied by any one.

The marvelous rapidity of development prepares one for the exceeding virulence of many diseases consequent upon the activity of germs. Their products are leucomanes, ptomains and toxalbumins which destroy the integrity of the tissues, overthrow the harmonious rule of the nervous centers and produce death as the necessary result of such inharmony. Bacteria are variously described according to conditions of growth, as ærobiotic, those growing in the presence of oxygen; and anærobiotics, those which do not grow in the presence of oxygen, while the term optional or facultative ærobiotic is applied to those which may thrive under either condition. It is worth more than passing notice that the presence of sunlight is deadly to most forms of germs, a fact of fundamental importance in sanitation.

According to their products bacteria are divided into several classes of which the pathogenic or disease producing kind alone interest us in a work of this nature. These germs may be developed locally and by their very presence block the channels of the fluids to or from the part, or they may by their chemotactic power effect the same result.

Effects of pathogenic germs.

Germs of suppuration are both toxic and chemotactic and by the effects of their toxins upon the cells with which they come in contact these in turn are destroyed and may be rendered chemotactic. Septic germs are those which multiply in the liquids and are thus distributed to all parts of the body.

That germs cause small-pox, scarlet fever, measles and other contagious and infectious diseases no sensible person will for a moment deny. The proofs are on every hand sufficient to satisfy the inquiring observer. But not so with the exacting scientist. In order that a disease can be attributed to a specific germ it must comply in every particular with Koch's tests mentioned above,—postulates first demanded by Henle but impossible with the methods in vogue in his day.

But the practical question comes to us, "How does the osteopath treat germ diseases?" Let me answer by another. How does medicine treat such cases? In diphtheria, in pneumonia and in pulmonary tuberculosis it would seem that vapors or topical application would prevent the ravages of the germ, but they are little used. In typhoid fever, in which disease the germ is demonstrated to be in the alimentary tract, drugs should be able to reach and destroy all such offending organisms, but even the advocates of medicine do not advise the use of drugs in this disease.

No drug a specific in germ diseases.

In no germ disease is there a safe and certain specific. The object of all treatment is to increase the resisting powers of the individual until there has been established within the body the germicidal powers of certain cells or germicidal serum, the product of these cells. When this condition is secured then the germs cease to multiply, the toxins are eliminated, the thermogenic centers are no longer excited, metabolism is reduced in rate, the thermolytic centers function properly, the fever falls and the patient begins to recover. Drugs now are given to stimulate the circulatory and other vital organs. The disease is self limited. By the very product of the germ activity its further development is limited. The osteopath in his treatment seeks to reduce and control the fever, thus preventing excessive metabolism. He allays nervousness and thus maintains equilibrium between the nervous system and the subordinate tissues. But *above all* he *removes obstruction* to the circulation in the affected organ and *sends to it the best blood in the body*. He increases oxidation and enriches the plasma and nourishes the germicidal cells. He controls thermogenesis and thermolysis. He also may, in a crisis, stimulate a heart as no medicinal stimulant can do. Foster, the great physiologist, says that electrodes and induction coils are rough means and

Osteopathy in germ diseases.

Mechanical stimulation nearest to normal.

that we may more nearly approach the normal phases of nerve action by mechanical stimulation, citing as an instance the reflex inhibition of the heart by vagal impulses, the result of irritating the abdominal splanchnics.

Thus in treatment of acute diseases, experience has shown that by a knowledge of the physiological functions of the various organs, and a knowledge of the manipulations necessary to arouse the latent powers of the body, the osteopath may very favorably affect all diseases usually considered as being of bacterial origin. That he accomplishes this is shown by the records of his treatments in pneumonia, typhoid fever, measles, diphtheria, etc. The treatments result in establishing an immunity against the further ravages of the germ.

Immunity defined.

This condition may be defined as the condition of an animal by which it resists the entrance of the disease producing germs or their growth and pathogenesis. It is both racial and individual. There are races which are immune to or susceptible to certain diseases. The negro is practically immune to yellow fever; he is especially susceptible to tuberculosis. The Jew is free from many diseases, but is especially susceptible to diabetes.

Man, then, has a condition of immunity, a condition of the body which resists disease. Circumstances may vary this power.

The virulent germ anthrax very few animals resist, but some do ; nor can this resistance be explained on structural difference. Immunity may be destroyed by a changed condition of the blood. Thus, exhaustion may make a person susceptible that would otherwise have been immune. The membranes of the nose are supposed, in health, to be germicidal. Susceptibility may be defined as that condition which favors the entrance, growth and development of pathogenic germs within the tissues.

Susceptibility.

There are various modes for the entrance of the germs of disease.

They may have an entrance through the skin or mucous membrane ;

By the respiratory tract, through its mucous membrane, which is different from the ordinary mucous membrane ;

Mode of entrance of germs.

Through the digestive tract ;

Through wounds ;

Through the placenta into the placental circulation.

From these sources they get into the blood stream. They may also have a passive entrance, that is, they may develop and grow outside and enter through the

walls of the vessels. They may be carried directly by the leucocytes or indirectly by way of the lymph stream or lymphatics into the venous channels.

Prevention of germ disease can be best secured by isolation. For those who must necessarily be exposed to the action of the germs there is nothing which will so protect against their entrance and action as perfect bodily condition, good action of the heart, thorough respiratory powers, good digestion and an observance of the rules of hygiene.

Disinfection must always be thorough. It should be the last action of the physician at the termination of an infectious case to cause a thorough disinfection of the room, furniture, bedding, etc., exposed to the germs. Of his own person he cannot be too careful. Antisepsis and asepsis are the safe-guards of every person who has charge of the health of others in time of sickness.

CHAPTER II.

PRINCIPLES OF OSTEOPATHY.

IN ALL organic life the cell is histologically and physiologically the unit. The conditions which are essential to its growth and development vary. In the undifferentiated state, that is, before the histological differentiation of the cells into the various tissues, the only thing necessary to the development of the cell is that the nourishment be continuous and the temperature, of course, be such as to permit of the normal actions of the cell. Instances of this kind are seen in the unicellular animals, and in the leucocytes and similar cells in man. In the more highly differentiated tissues the activity of the cell is dependent on another condition, that of nervous control. The nerves as higher tissues, through their impulses, act as controlling influences. The normal performances of cell function are irritability, contraction, assimilation, growth, reproduction and excretion. These functions summed, modified and correlated constitute the

Cell essential to development.

phenomenon of life. Since health is a condition in which every organ and part adequately performs its function, then it must follow that the health of the organ is dependent upon the healthy condition of the cell, for the organs are composed of cells and their products. The cell is really the important part of every tissue and its health or disease depends upon the blood and nerve supply.

Health maintained by blood and nerve.

First. This is a basic principle of Osteopathy, that through the blood supply and the nerve supply to the tissues, is the health of the body maintained.

Second. It is a law of physiology that any impairment in the structure or function of an organ causes tenderness on pressure, and tenderness on pressure is the best evidence of a lesion of an organ, that is, a lesion in the sense in which we have defined it — any abnormal condition. It is not always possible to reach the organ directly, but it is possible in all cases to reach the efferent or afferent nerve fibres of the organ. These nerve fibres are sensitive to pressure just as are the nerve fibrils in the organ itself.

Tenderness evidence of a lesion.

Third. Tenderness along the course of the nerves of any organ is an evidence of a lesion of the organ. The lesion may be temporary or permanent.

Fourth. Pain is a warning of a pathological state of an organ or a tissue and may be referred to the

tissue or organ affected or to some other distribution of the nerve through its branches. Hence, pain as the sign of a lesion may refer to the organ affected or to the peripheral distribution of the nerve. There will be tenderness somewhere. Pain does not always warn you where the lesion is. Every practitioner is familiar with cases in which treatment has been directed to the knee when the trouble is in the hip. If you follow the pain back far enough you will find it is due to the condition somewhere of the nonperformance of function of some organ, and nonperformance of function is a lesion in the sense in which we defined it.

Effect of muscular lesion.

Fifth. Any irritation to an efferent nerve, either central, peripheral or along its course disturbs the vaso-motor and motor equilibrium between organ and nerve center and leads to a consequent contraction of the muscles innervated by the corresponding segment of the central nervous system. This contraction tends to increase the severity of the symptoms and to prolong the disturbed effect. This same result follows the primary lesion of a viscus, irritating its afferent nerves.

Sixth. Any irritation to a nerve or interference with the passage of the physiological nerve impulses to an organ may produce a lesion of that organ. In any case there will result a disturbed vaso-motor equilibrium and an increased contraction and increased

irritation to the muscles supplied by the nerves from its segment.

Seventh. In like manner a continual irritation may lead to an increase of connective tissue, shortening and thickening the ligaments, interfering with circulation, nerves and tendons and so prolonging the disease and aggravating its symptoms. Thus, if the muscles are contracted at the fourth, fifth and sixth dorsal regions, it means there is a variation from the usual amount of blood sent to that region and this change in blood supply means an increase in growth of connective tissue. This increase in growth of connective tissue around the vertebræ will overcome the freedom of their motion and lead to irritation of and pressure upon the nerves passing from this region. This irritation is referred to the stomach and cannot be removed until you remove the cause. For this reason we invariably treat the spine to relieve this condition. Disease of the stomach may have caused a congestion of these muscles and their increase in size until they encroach upon the pathway of the nerve. We must first overcome the contraction, whether it be the cause or the product of the disease. Then we can restore the normal condition of the nerves and nature will do its work.

Eighth. Any obstruction to the free passage of the efferent impulses to an organ may result in diminution or a cessation of the normal metabolism of the organ, either trophic or secretory, or both, thus directly leading to a diseased condition of the organ or producing a nidus for bacterial activity, or resulting in destructive metabolism and finally in all cases in disease. *Obstruction leads to disease.*

Ninth. The human body is a machine for the transformation of energy. The amount and quality of this energy formed in a large measure determines the individuality of the person. The proper distribution of this energy determines the health of the individual. Any interference in the production, manifestation, or distribution of energy will result in a changed metabolism — a condition called disease. This diseased condition may remain indefinitely so long as the condition which produced it remains, the disease then being called chronic. Now any restoration to health must be accomplished by changing the rate of manufacture, the quality or the equalization of the bodily energy. This cannot be secured by adding foreign substances to the mechanism, but by the simple process of adjustment and correction. The friction removed, the delicate structures replaced in their proper positions, the vital actions proceed uninterruptedly, ease *The body a machine.*

succeeds disease, strength follows weakness, pain disappears. There is no radical change from the usual conditions which give health. The organism demands nothing new.

Tenth. Oxidation is the process by which bodily changes are produced—bodily temperature maintained. Motion increases oxidation and energy. Any influence which decreases energy retards metabolism and forms incomplete oxidation products. These suboxides are disease producing. Therefore any manipulation which tends to increase motion removes suboxides and compels a restoration to health. Motion is health.

Skin a nervous organism.

Eleventh. The skin is largely a nervous organ. This in health receives the normal physiological impulses which pour into the central nervous system, there producing changes and arousing afferent impulses. These afferent impulses maintain the tonic conditions of glandular and other tissues of the body. Any increase or decrease of these impulses may lead to a disturbance of any of the outgoing impulses, either increasing or diminishing them. Thus the skin may, by artificial stimulation and a hyperæsthetic condition, depurate the nerve centers, causing exhaustion. On the other hand in conditions of anæmia and anæsthesia stimulation of the sensory nerves in the skin may arouse

afferent impulses to the proper physiological degree which will restore the lost vigor and tone.

Twelfth. Passive muscular movement necessarily entailed upon osteopathic treatment serves in many cases to restore the equipoise between nerve centers and the muscles by distributing the energy. This means health. The condition in many cases of disease is that of disturbed equipoise between muscle and nerve centers. Passive muscular exercise serves to divert the energy from the nerve centers to its proper distribution, the muscles, thus re-establishing the proper equipoise which is health producing.

Thirteenth. When several muscles are supplied by branches of the same nerve their function is to act in harmony and in unison; this fact is of value in diagnosis of lesion in case of loss of muscular power. The reader is able to supply numerous examples of such arrangement.

Fourteenth. "Superficial pains on both sides of the body, which are symmetrical, imply an origin or cause, the seat of which is central or bilateral; while unilateral pain implies a seat of origin which is one-sided, and, as a rule, exists on the same side of the body as the pain." Every pain has its distinct and separate signification.

Value of superficial pain.

Hilton's law.

Fifteenth. "The same trunks of nerves, whose branches supply the groups of muscles moving a joint, furnish also a distribution of nerves to the skin over the insertions of the same muscles; and the interior of the joint moved by these muscles receives a nerve supply from the same source."

Sixteenth. "Every fascia of the body has a muscle or muscles attached to it, and every fascia must be considered as one of the points of insertion of the muscles connected to it."

Seventeenth. Steady pressure upon the terminal filaments of a nerve or upon the course of the nerve will prevent the passage of impulses along the nerve, thus inhibiting its action. Motion, sensation, reflexes, vaso-motor effects are all alike affected; hence increased activity of any organ is reduced to the normal by pressure on the nerves of the organ. The inhibitory nerves are of course an exception to this rule. Pressure upon these would produce no effect or else increase the activity of the organ; the effect being dependent upon whether the nerves were in action at the time.

Eighteenth. Activity of an organ may be aroused by stimulating the functional nerves to the organ. Marked variations in pressure upon any portion of a nerve will stimulate the nerve. Thus the osteopath

treats a nerve to arouse its activity by successive variations in pressure rapidly applied.

Nineteenth. The points along the nerves where stimulation will be most effective are (1) at the periphery of the nerve, (2) at the emergence of the nerve from the spinal canal. Inhibition is likewise most easily accomplished at these points.

Twentieth. A stimulation of the vaso-constrictor nerves of an organ will diminish the amount of blood pressure in the capillaries; their inhibition will produce the opposite result. The latter is the condition in inflammation and œdema—the former overcomes these conditions.

Vaso-motor effect on capillaries.

Twenty-first. Head has found that "*When a painful stimulus is applied to a part of low sensibility in close central connection with a part of much greater sensibility, the pain produced is felt in the part of higher sensibility rather than in the part of lower sensibility to which the stimulus was applied.*"

Tactile sensations sometime act in the same way—a transference called allochiria. This law of transference of effects of nervous stimulation may be carried further and applied to motion, as in cases from a reflex affecting the opposite member; to vaso-motor changes and to all forms of nerve impulses. Nor is this all. Just as sensory, motor and vaso-motor

impulses may be transferred, so, too, may inhibition act reflexly. The skin and muscle of a spinal segment are supplied by afferent nerves from the same central origin, a region which also gives origin to efferent nerves going to some one or more of the viscera. By pressure on these sensory fibres we check the deluge of impulses into the center and thereby decrease the chemical changes within the center itself. It is upon these chemical changes that the nature, quality and quantity of the outgoing impulses depend. To reduce these to the normal will serve to restore the organ to harmonious relations. This is a fact of fundamental importance in our treatment. Our practice shows beyond possibility of error that inhibition of the periphery of one branch of a sensory nerve will reduce the expression of pain in other branches of the nerve.

Head's law is a statement of the fact upon which we base many of our diagnoses by spinal examination. The various deductions from it are applied in treatment of nearly all pathological conditions.

Cure depends on removal of cause.

Twenty-second. The only natural and rational method of treating such conditions is by removal of the cause, and this result (except in cases demanding surgical interference) is perfectly secured only by such manipulation as will overcome all interference to the

free passage of the efferent and afferent impulses between organ and center; and by stimulation or inhibition counteract the present condition of innervation or irritation, thus allowing the inherent recuperative power of the body to restore to normal structure and function the deranged organ.

Osteopathy is a therapeutic science grounded upon the known and verifiable laws of physiology just enumerated. From those principles we deduct our definition of the science. *Osteopathy is a method of treating disease by manipulation, the purpose and result of which is to restore the normal condition of nerve control and blood supply to every organ of the body by removing physical obstruction, or by stimulating or inhibiting functional activity as the condition may require.*

Osteopathy defined.

By the term physical obstruction we mean any direct interference to the nutritive or functional fluids or forces of the organ, as pressure upon a vessel or nerve by an abnormal condition of some denser tissue of the body. This will cut off the nerve force and affects the blood supply. Either of these may result in producing an abnormal function of some organ or organs and thus lead to a diseased condition.

Osteopathy achieves its chief results through the nervous system. Nerve action may be influenced:

First. Through the centers directly. We may effect a certain nervous control of the abdominal organs by pressing directly, as near as possible, over the solar plexus. Pressure there may act to inhibit the impulses sent out from that center which are producing pain in the various abdominal organs.

Second. We may influence nerve action through the fibres. We do this in various ways. We may affect the fibres by removing any obstruction to the nerve impulses along the fibre, or we may affect the fibre by stimulation, not by removing the cover, but through the medium of the covering structures, putting alternate pressure upon it in such a way as to stimulate it.

Stimulation defined.

Stimulation is a broad term and may be defined as the act of producing or increasing functional activity. The methods of accomplishing this are varied; physiological or natural, mechanical, thermal, electrical and chemical. Of these the first or physiological is the result of the interaction of the organs and the reaction of the nervous system to the stimuli of the environments. In conditions of health this kind is sufficient; in response to it the heart keeps up its rhythmic throbbing, the glands act, the various organs perform their functions. Each increased strain, within limits, produces more activity. The skeletal muscles are in a partial state of contraction

called skeletal tone in response to a continual rain of impulses through the organs of touch, temperature, sight, smell, the muscular sense. While this is true for the skeletal muscles it is eminently the case in the condition known as arterial tone. Upon those impulses from without depend the healthful state of the circulatory system. These stimulations are continuous and conducive to perfect action. The air stimulates the skin, it reacts upon the wall of the alveoli, the blood causes the centers of the organs to keep up their constant outgoing impulses. The second and most nearly natural in its effects is the mechanical, the mode which the osteopath uses to the exclusion of the others for the purpose of assisting nature.

Mechanical stimulation in its effects is similar to physiological. There are two ways by which the osteopath, through pressure, affects nerve fibres. One is by variation in the degree of pressure, producing stimulation. The other by continued steady pressure cutting off the passage of impulses along the nerve, thus producing inhibition. Experience shows that steady pressure upon a nerve will produce no pain or impulse, even though carried to the extent of crushing the fibre of the nerve. We will now define inhibition as an act which restrains or retards functional activity. Inhibition of an organ may be produced by preventing

Inhibition.

the passage of impulses to it, or it may be produced (as is the case of inhibitory fibres to the heart which pass through the vagus nerve), by impulses to the organ whose effect is to restrain the action of the organ. The osteopath must understand this double meaning of the term for he frequently uses both methods of producing inhibition.

This question now presents itself to us: In what way may we repress or excite action? Nervous tissue controls the other tissues. It is by nervous connection that the organs of the body perform their normal function.

Excitation of an organ may be perfectly and positively secured only by removal of obstructions to the free passage of efferent and afferent nerve impulses to the organ. It is clear that continued steady pressure upon a nerve prevents the passage of impulses through the nerve. This would produce a cessation of the normal flow of these impulses to the organ, as is illustrated by constant pressure on the nerves to the stomach. But it might have two effects. If it were perfectly constant the pressure would have the effect of restricting the normal impulses from the cerebro-spinal center, resulting in diminution of functional activity. There would result enervation or loss of tone of the organ, tone to which it is entitled. Vary-

Pressure may have two effects.

ing pressure will increase these impulses, thereby increasing the tone and activity of the organ.

Tone is that healthy, normal state intermediate between complete relaxation and contraction, produced by a summation of impulses from the external world sent along the pathway of the nerve to the central nervous system; and there, by a reflex mechanism sent out to the muscles which are controlled by the same segment of the cord. Thus we have arterial tone as a result of reflex mechanism in continual action. It is a state of partial contraction characteristic of muscles which enter into the structure of the blood vessels. By tone or tones of glands or centers we mean their physiological state of activity.

These facts will serve to illustrate how obstruction to nerve impulses may interfere with the normal function of the organ by lessening the activities, thus serving as an inhibition.

Physical obstruction or interruption may interfere with functional activity by increasing it. If steady pressure in any way becomes a varying pressure, however slight, that would result in a constant irritation to the nerves, producing impulses exciting the organ to unusual activity and finally to a pathological condition. So, too, by interference with the nutrition of a region the irritability of its nerves would be affected

and a changed metabolism result. Again, we may remove obstruction which serves as an inhibition, resulting in a stimulation. Nerve activity is basic to the activities of the other organs of the body.

Nerve activity basic.

Nerve action may be influenced by action upon the centers themselves. A physiological or true center means a group or collection of nerve cells connected with some specific organ or function by means of afferent and efferent fibres.

Osteopathic center defined.

Osteopathic centers are entirely different. An osteopathic center is a practical one. By the term we do not necessarily mean a local group of cells controlling function, but a point at which we may most advantageously reach the nerves or cells controlling the organ. To illustrate: The center for coughing is near the third dorsal vertebra; there is not at that point in the spinal cord a group of cells whose function it is to produce coughing. We mean that there are entering that region afferent nerve fibres whose impulses have been transmitted, resulting in a muscular contraction, giving rise to a cough. By removing the irritation thus preventing the impulses coming from that periphery to the center, we have treated the center.

At the points of emergence of spinal nerves we are able to obtain more satisfactory results than at any other. Because we get certain results by treating cer-

tain spinal nerves we cannot assert there is a true physiological center at that level in the cord. Centers may be anywhere so far as treatment is concerned between emergence and peripheral ending of a nerve. This will explain why we speak of centers osteopathically which have no physiological existence.

How treated.

We stimulate centers by treating their afferent and efferent nerve fibres. Our effects are from stimulation or inhibition along the pathway of the nerve. We may further stimulate the action of the center by stimulating the peripheral distribution of the sensory nerve. We will go farther: We are able to treat directly the muscular tissue and produce contraction, or inhibition of muscular contraction. In this we draw our conclusions from a limited number of cases. In cases of perfect anæsthesia contracted muscles will, under osteopathic treatment, relax as perfectly as though the sensory nerve fibres were functioning. Whether it is the result of direct stimulation of the muscle is a question we cannot answer with certainty, though the indications are to that effect. In a case that came under my observation the anæsthesia was so complete that even pressure upon the deeper muscles produced no sensation. I argue from that case that a muscular tissue will relax

on treatment when not connected with the sensory fibres as readily as when it is.

The point is this: It is not necessary in order to produce an effect upon a muscle, particularly if that effect be relaxation, to stimulate the endings of the sensory nerves in the skin. The greater part of our work of relaxation is accomplished on the more deeply lying muscles. Painful stimulation of the sensory nerve of the skin produces a defensive contraction of the muscle underneath, therefore, the best results are obtained with the minimum amount of pain. To this end it is necessary to place the hands gently on the integument above the muscle which you desire to relax, care being taken to use the flat portion of the fingers. Now by approximating the fingers of the two hands you will produce a fold of skin between them. Now strong pressure will produce practically no sensation of pain in the cutaneous nerves. If this pressure be accompanied by a separation of the hands the effect of relaxation will be produced on the contracted muscles felt beneath.

Painful treatment useless.

I will here emphasize the caution just expressed, that you, as far as possible, eliminate the use of the ends of the fingers in treatment. Since it often happens that your first treatments are directed towards overcoming headaches and therefore administered near the

base of the skull, congestion or chronic contraction sometimes follow from the application of too much force to a limited space beneath the ends of the fingers. There are few regions, if any, which yield so readily to osteopathic manipulation as the neck. There is no part of the body more susceptible to injury if treatment be incautiously applied.

We are able to inhibit contraction of a muscle by osteopathic treatment applied directly to the muscle itself. It is a physiological fact, that direct application of stimulation to a muscle itself will produce contraction. From experience we say we can overcome a contracted condition of a muscle, though the sensory nerves are not in any way affecting it; e. g., in case of perfect anæsthesia.

Effects of mechano-therapy.

Dr. Schreiber sums up the effects of mechano-therapy as follows:

First. To cause an increased flow of blood to muscles and soft parts, increasing thereby the circulation, and removing accumulations of waste tissues whose retention causes various disturbances of function.

To strengthen muscle fibres, and by setting up molecular vibrations to induce changes, not only on the muscle and nerve fibres, but perhaps even in the nerve centers themselves.

Second. To cause the resorption of exudations, transudations, and infiltrations, in such organs as are accessible. To effect the separation of adhesions in tendon sheaths and in joints, without recourse to the knife. To remove, by grinding away, intra-arthritic vegetations.

Third. To increase by passive and active exercise of all the muscles, the oxidizing powers of the blood, in this way correcting disturbances in its composition and stimulating all the vegetative processes.

Fourth. To relieve the congestion of such internal organs as the brain, lungs, intestines, uterus, kidneys, etc., by increasing the flow of blood to the muscles.

Fifth. To stimulate directly the sympathetic nervous system, thus increasing secretion and reflexly the activity of unstriped muscle fibre, and so relieving various functional derangements.

CHAPTER III.

SYMPATHETIC NERVOUS SYSTEM.

THE UNITY apparent in the structure of the nervous system is evidenced in a physiological unity, harmony and interdependence which proves the truth of the statement that an isolated portion of the nervous mechanism does not exist in a perfect individual. Aside from the central nervous system there is what is known as the sympathetic system. This term includes the following distribution: To the internal viscera; to the glands outside as well as within the hemal cavity; to the vessels as vasomotors, and to the hairs as pilo-motors. Their complete distribution is to the viscera, vessels and to the plain muscle fibres generally. But this distribution to the plain muscular tissue is not confined exclusively to the sympathetic system, the vagus having extensive visceral distribution. In addition to this, many fibres from spinal nerves have visceral con-

nection, either passing through the sympathetic ganglia unchanged or not entering it.

Structure.

The sympathetic system consists of a collection of ganglia, nerve trunks and plexuses. The ganglia contain cells, and fibres both gray and white, the latter in all cases connected with cells within the cerebro-spinal system. The plexus is essentially a network of fibres, though it may also contain cells. The *gray* fibres are truly sympathetic, having their trophic connection with the cells in the sympathetic system.

With these extensive ramifications it is necessary that there be a varied and complicated mechanism; hence we find:

First. The two great gangliated cords extending from the ganglion of Ribes above, connecting the carotid plexuses via the anterior communicating artery, downward to the coccyx where the two sacral chains are united by a ganglion (the coccygeal, or the ganglion *impars*), situated on the anterior surface of the coccyx.

Second. The great prevertebral plexuses.

Third. The fibres and plexuses of distribution. [There are also connected with the cranial nerves, ganglia which in structure and connections agree with the sympathetic and may be considered as a part of

this system.] The first of these groups, the great gangliated cord, consists of ganglia connected by short cords, the ganglia being named cervical, dorsal, lumbar, sacral, etc., approximately corresponding to the vertebræ, except in the cervical region, where the segmental arrangement has been modified by a segregation of seven into three, called superior, middle and inferior cervical.

White rami communicantes.

The foundation of the sympathetic system is constituted by small, white fibres from the cerebro-spinal system through certain nerves into the cords and ganglia of the sympathetic. These constitute the *white rami communicantes*, which connects the cerebro-spinal and sympathetic portions of the nervous systems.

They come, in man, from the first thoracic to the second lumbar, inclusive, being both afferent and efferent in function. In the sacral region the homologues of the white rami pass directly to the prevertebral plexuses and are thence distributed to the pelvic viscera as splanchnic divisions of the sacral nerves. There are no white rami in the cervical region. The visceral branches of the third nerve (to ciliary ganglion via short root), of the seventh, ninth, tenth and eleventh, correspond in function to the white rami.

White rami enter the sympathetic either at the lateral ganglia or at the cords connecting them, and

may come from both roots of the spinal nerves. Those of the posterior root are from the spinal ganglia and are afferent fibres. Those from the anterior are efferent. These white fibres end in any of the following ways :

First. Losing their sheaths in the lateral ganglia, they end in dendritic brushes within the lateral ganglia.

Second. Some pass unchanged through the lateral ganglia to the prevertebral plexuses (white *rami efferentes*), or they may continue as spinal fibres to their distribution.

Third. The fibres of the white rami ending in the lateral ganglia may branch before entering, giving off one, two or three collaterals, thus connecting with several ganglia.

Fourth. The fibre may not end in its corresponding ganglion, but may pass to ganglia at either higher or lower levels.

Functions. The functions of the white rami are varied. They transmit all the impulses from the cerebro-spinal system to the sympathetic ganglia and plexuses and vice versa. This work is done by those which end within these structures. These are :

First. Vaso-constrictors, from anterior roots, ending in lateral ganglia.

Second. Cardiac augmentors, ending in middle and inferior cervical ganglia and in first thoracic.

Third. Viscero-motors from certain spinal nerves, also the corresponding fibres from the ninth, tenth and eleventh cranial nerves.

Fourth. Pilo-motor fibres, also motor nerves to sphincter of iris through third nerve.

Fifth. Secretory fibres to the sweat glands and to the glands of the various viscera.

Sixth. Viscero-inhibitory fibres also end in this way, though in some cases they pass directly to the viscera.

Seventh. Afferent fibres from viscera to cerebro-spinal center.

In addition to these white fibres which transfer their impulses to the sympathetic and are succeeded by gray fibres, the vaso-dilator fibres pass unchanged to the viscera, though some seem to end in the solar plexus. Gray *rami communicantes* connect the lateral cord with *all* the spinal nerves. They are neuraxons of cells lying in the lateral ganglia, usually the one from which they make their exit to the spinal nerve, though rarely they pass upward or downward through the cord to the succeeding ganglion. They unite with the anterior primary division of the spinal nerves and have any one of the following distributions:

Gray rami communicantes and their distribution.

First. Peripherally to the distribution of the anterior division of the spinal nerves, — to their muscular and cutaneous distribution.

Second. They may follow the anterior division centrally to the main nerve trunk, whence they follow the posterior primary division to its distribution.

Third. Centrally to the recurrent branch of the spinal nerve and with it to the wrappings of the cord and to the structure of the cord itself.

Fourth. Back through the wrappings of the posterior root, to the dura of the cord.

The first and second vaso-constrictors are distributed to the vessels of the skeletal muscles and of the skin, secretory to the sweat glands, and pilo-motors to muscles of the hairs.

The third and fourth are vaso-motor to the cord — mainly vaso-constrictors.

In addition to the *rami communicantes* there are true sympathetic fibres, originating in the lateral ganglia, which pass forward to the prevertebral plexuses. With these are medullated fibres which have passed through the lateral ganglia, together constituting the *rami efferentes* — the gray, sympathetic; the white, spinal.

The function of the sympathetic system may be stated generally as follows: It presides over the move-

ment of the plain muscle tissue, nutrition partially, secretion usually, general sensibility of the viscera, thermotaxis and vaso-motor conditions. When disturbed reflexly it affects one viscus from another and may act almost independently of the cerebro-spinal system under unusual conditions.

Functions of the sympathetic.

Specifically the functions of the sympathetic may be classed as follows:

1. Independent, actions which continue when all connection with the central nervous system has been destroyed as in the (*a*) ganglia of the heart, (*b*) the mesenteric plexuses, (*c*) the plexuses of the uterus, Fallopian tubes and ureters.

Even these are modified either in the direction of stimulation or inhibition by impulses from the cerebro-spinal system.

2. Dependent,—

(*a*) Afferent impulses.

(*b*) Secretory action and trophic.

(*c*) Vaso-motor.

The *superior* cervical ganglion is situated on the rectus capitis anticus major muscle internal to the tenth nerve and behind the internal carotid artery at the level of the second and third vertebra. It is connected with the first four spinal nerves, and with the ninth, tenth and twelfth cranial nerves. This ganglion

Superior cervical ganglion and connections.

is almost an inch in length and a fourth as wide, and is of great importance to the osteopath, as through it he controls the vaso-motors to the head and face. It is continuous above with the carotid and cavernous plexuses and through this with the arteries and vessels of the brain. Below it is connected with the middle cervical ganglion which lies opposite the sixth or seventh cervical vertebra, almost at the level of the inferior thyroid artery. Above, this ganglion is connected with the cavernous and carotid plexuses and through these gives communication to the sixth nerve within the cavernous sinus, and with the Gasserian ganglion as the internal carotid artery passes through the apex of the petrous portion of the temporal bone.

Relation to the eye.

The cavernous plexus sends filaments into the third and the fourth nerves, thus completing the control of the blood supply to the eye and its motor apparatus. This fact is of prime importance in eye trouble. Osteopathic experience proves that trouble with the eye is associated with a lesion in the upper cervical region, located in the vast majority of cases, at the second and third vertebræ.

The reasoning is plain. Here is the pathway of those vaso-motor impulses to its nutrient vessels, and their interruption means trouble with the nutrition and action of the eye.

It is followed upward from the superior cervical to the cavernous plexus, and from it to the twig following the arteria centralis retinæ to the vessels of the inner part of the globe of the eye. The same pathway answers for those fibres which control the muscles of the orbit, differing only in their final distribution.

This ganglion controls the lumen of the anterior pial vessels and is of value in draining the cranial cavity in frontal headache due to congestion and venous stasis.

Distribution from Meckel's ganglion.

The large deep petrosal branch, the sympathetic root of the Vidian nerve, is from the carotid plexus and through this channel it supplies sympathetic fibres to Meckel's ganglion and through it to its distribution to the orbit, the palate, the nose, the pharynx, the antra, ethmoidal sinuses, tonsils, uvula, etc.

The cavernous plexus lies closely associated with the carotid plexus in the cavernous sinus and sends fibres to the third and fourth nerves, and also to the ophthalmic division of the fifth nerve and through it to the ciliary ganglion. The importance of this ganglion in eye trouble, epistaxis, œdema of glottis, pharyngitis, laryngitis, sore throat, diphtheria, croup, etc., is readily seen. By stimulating the ganglion the blood vessels of these parts are constricted, capillary pressure is removed,

resorption takes place, and normal secretion and action is secured. Again this ganglion affords more direct connection with the pharynx than through the sphenopalatine ganglion, for it gives numerous fibres which following the blood vessels, are distributed with the ninth, tenth and eleventh nerves, forming the pharyngeal plexus. Aside from this the superior cervical ganglion gives off a branch which is of much importance in contributing to the great cardiac plexus.

This ganglion controls the nutrition of the muscles of the face, the action of the mucous and salivary glands and even contributes to nourish the fifth nerve, the great sensory nerve of the head and face. This will make plain the value of this ganglion in diseases affecting the nerves and musles of the face, the mucous tract of the throat with its adenoid masses beneath. This ganglion contains a large number of cells which mark the beginnings of the fibres going to the distributions above mentioned.

Middle cervical ganglion.

The *middle* cervical ganglion is situated anterior to the transverse process of the sixth or seventh cervical vertebra. It lies near the inferior thyroid artery and contributes fibres to it which control the lumen of its branches in the thyroid gland. It is associated in function with the superior cervical ganglion, transmitting the fibres from below which end in the superior

cervical ganglion. These fibres, as all the spinal fibres in the cervical sympathic, come from the dorsal spinal nerves; and, as white fibres, pass up to the ganglia in the cervical region. Ending in this middle cervical ganglion are many cardiac augmentor fibres which have made their exit from the cerebro-spinal system at the second, third and fourth thoracic nerves. Beginning in this ganglion are the fibres which constitute the middle cervical sympathetic cardiac fibres, and which pass down into the thorax, helping to form the cardiac plexus. This middle ganglion then has three uses. In manipulation, steady pressure upon it will dilate the vessels of the head and face, will retard slightly the action of the heart, will dilate the vessels in the thyroid glands. Pressure alternately applied and removed will have the opposite effects. This nerve connects with two cervical nerves, the fifth and sixth, furnishing vaso-motor and perspiratory fibres to them.

The *inferior cervical ganglion* is situated between the sides of the seventh cervical vertebra and the first rib and by its position is in connection above with the middle and superior cervical ganglia and below with the gangliated cord. Ofttimes it is a mass united to the first thoracic and corresponds to the stellate ganglion in the lower animals — either the first thoracic or

Inferior cervical ganglion.

a union of several of the thoracic. It is situated over the first costo-central articulation between the vertebral and the subclavian arteries external to the vertebral and almost behind the inferior thyroid artery. It is connected to the middle ganglion by a cord, passing behind the subclavian artery. This cord is frequently double, passing both behind and in front of the artery.

Annulus of Vieussens.

This anterior cord is called the ansa subclavian or annulus of Vieussens. It sometimes extends from the cord below the middle cervical ganglion to the lower cervical or to the first thoracic. This annulus is much more frequent on the left side than on the right and by its contribution to the cardiac plexus exerts a powerful influence over the action of the heart. The branches of the inferior cervical ganglion are: 1. To the two lower cervical nerves it gives vaso-motor fibres. 2. The inferior cardiac sympathetic to the cardiac plexus. 3. It supplies fibres to the vertebral artery extending with it to the cranial cavity and controlling the blood vessels of the posterior fossa of the skull. It also sends fibres along the inferior thyroid artery into the thyroid gland, affecting both its vessels and its action. It controls the internal mammary artery and the comes nervi phrenici artery from this vessel. This ganglion is a strong point of attack in the treatment of the following organs and diseases: (1) the thyroid gland

in goiter; (2) the circulation — sending augmentor impulses to the heart, if pressed upon sharply and alternately; (3) it has an effect on the phrenic nerves in many cases of asthma.

Function of cervical sympathetics.

The cervical sympathetic receives no fibres from the cervical nerves but receives its spinal fibres from the dorsal nerves. It contains:

(*a*) Vaso-constrictor for head from second, third and fourth dorsal.

(*b*) Augmentor fibres to heart, chiefly from second, third and fourth dorsal.

(*c*) Secretory fibres to salivary glands, upper dorsal.

(*d*) Pupilo dilator and motor fibres to the involuntary muscles of eye and orbit.

(*e*) Afferent fibres whose stimulation causes activity of the vaso-motor center in the medulla.

Functions of thoracic sympathetics.

The thoracic portion of the gangliated cord consists of two cords lying on either side of the vertebræ, within the hemal cavity and connecting above and below with the cervical and the lumbar respectively. It consists of eleven, rarely twelve, ganglia with their connections, corresponding approximately with the costo-central articulations, though in the case of the upper one or two and the lower there is a slight failure to correspond to these positions. The branches of

distribution from the upper four or five are given chiefly to the corresponding vertebræ, their ligaments and to the descending portion of the thoracic aorta. From the second, third and fourth branches are sent to the posterior pulmonary plexuses which gives innervation to the vessels of the walls of the bronchial tubes and of the bronchioles within the substance of the lung itself. These fibres connect within these plexuses with the fibres from the pneumogastric, whence are furnished the motor impulses and sensory fibres to the walls of the air passages, the sympathetics affording the vaso-motor fibres. This distribution explains why the "centre" for the lungs is said to be in the upper dorsal region; and also the philosophy of our treatment for such conditions as bronchial troubles, emphysema, pneumonia, tuberculosis of the lung and kindred affections. This, then, is what the osteopath calls the centre for the lungs located at the second, third and fourth dorsal. From the lower dorsal ganglia beginning at the fifth or sixth are given fibres to form three large nerves, the splanchnics, or the abdominal splanchnics of Gaskell, which are of wide distribution to the abdominal viscera, being transmitted in three separate and distinct trunks, the great, the small and the smallest splanchnics. The great splanchnic takes origin from

the fifth to the tenth dorsal ganglion inclusive, and may be traced upward to the third or even the second thoracic ganglion, and passing downward through the crus is distributed to the semilunar ganglion and through it to the renal and suprarenal plexuses. Some of the fibres of this nerve are truly sympathetic fibres, while the majority are medullated fibres from the spinal cord. The small splanchnic comes from the ninth and tenth, or the tenth and eleventh and follows in the pathway of the great splanchnic and is distributed to the solar plexus and sometimes on the plexus to the kidney — the renal plexus. The smallest splanchnic comes from the eleventh ganglion, or from the region corresponding to the twelfth thoracic vertebra and its distribution is to the kidney. The term splanchnic should be used to include all nerves whose distribution is to the various viscera, but the more restricted use of the term has limited it to the nerves mentioned and we shall follow the general use of the term.

A summary of the functions of the thoracic sympathetic is useful :

1. Augmentor fibres to cardiac plexus from second, third and fourth.

2. Vaso-constrictors to the lungs, second, third and fourth.

3. Certain afferent fibres whose stimulation results in cardio-inhibitory action in the medulla, sixth to tenth.

4. The splanchnics contain vaso-constrictor fibres to abdominal vessels and other plexuses of the abdomen.

5. The secretion of the intestinal glands.

6. Secretory to sweat glands.

7. Vaso-constrictor for arms, upper sixth dorsal; for legs, lower dorsal and second lumbar.

8. Viscero-inhibitory fibres to stomach and intestines. The motor fibres of the intestinal tract, except the rectum, are from the vagus.

In the lumbar portion of the gangliated cord there are usually four small oval ganglia closely situated in front of the bodies of the lumbar vertebræ along the inner margin of the psoas muscle. On the right side the cord is under cover of the vena cava, on the left it is beneath the aorta. The branches connecting the spinal nerves with the ganglia accompany the lumbar arteries and are covered by the fibrous bands from which the fasciculi of the psoas muscle originate.

These ganglia, with their branches, connect with the plexus around the aorta; some fibres reach the hypogastric plexus and through it the pelvic

plexus, others going to the ligaments and vertebræ within the lumbar region. Descending from the thoracic cord to the lumbar we find fibres having almost the same function as the thoracic sympathetic.

Lumbar sympathetic.

In the lumbar sympathetic we find viscero-inhibitors to the descending colon and rectum, vaso-constrictor to the pelvic viscera, to lower abdominal vessels. These are from lower dorsal and first and second lumbar. From this source come the vaso-constrictors to legs; vaso-constrictors to penis, first and second lumbar to hypogastric plexus, thence via pudic nerve as gray fibres. Motor fibres to bladder, upper lumbar. Motor fibres to uterus, first and second lumbar. Motor fibres to vas deferens (male), round ligament (female), first and second lumbar.

The sacral sympathetic is diminished in size, consisting of a variable number of ganglia, usually four, joined below by a loop on which is the ganglion impars (the coccygeal ganglion). This portion of the sympathetic sends fibres to the pelvic plexus, others to the plexus on the sacral artery, to the ligaments, to the coccyx and to the coccygeal gland. There are no fibres passing into the lateral ganglia from the sacral nerves, these being supplied from the lumbar cord above.

Peculiarities of sacral splanchnics.

The visceral branches of the sacral nerves are equivalent to white rami. They pass at once to the pelvic plexuses or to the pelvic viscera.

Because of this direct relation between the visceral branches of the sacral nerves and the somatic divisions, the pelvic viscera respond very readily to sacral manipulations. In the sacral region we find:

1. Motor fibres to rectum.
2. Motor fibres to bladder.
3. Vaso-dilators to penis — *nervi erigentes*.
4. Secretory fibres to prostate gland.

There are three prevertebral plexuses — the cardiac, solar and hypogastric, each of which has connections with and subdivisions in minor plexuses which are to be regarded as prolongations of the sympathetic along the blood vessels.

The *cardiac* is a plexus deriving fibres directly from the vagi and the cardiac branches of each of the three cervical ganglia referred to above. It is divided into two portions; superficial plexus just anterior to the aortic arch, and deep cardiac plexus situated behind the aorta anterior to the end of the trachea and above the bifurcation of the pulmonary artery.

Formation of cardiac plexus.

The superficial is derived from the superior cervical branch of the sympathetic and from the lower cervical cardiac branch of the pneumogastric on the left side.

The deep cardiac plexus is formed by all the cardiac branches from the cervical sympathetics, except the superior cervical cardiac on the left side and the inferior cardiac branch of the pneumogastric of the left side. From this plexus fibres extend along the pulmonary vessels to form the greater part of the anterior pulmonary plexus, being assisted in this work by a few fibres from the anterior pulmonary branches of the tenth nerve. The posterior pulmonary branches of the vagus unite with the fibres from the second, third and fourth, sometimes also the first thoracic ganglia, and forms the posterior pulmonary plexus which is distributed to the substance of the lung, including the muscles to the air tubes and the vasomotors to the various tissues of the organ. Here, too, fibres are given off which form plexuses on the coronary arteries of the heart. From this plexus we find fibres going to the heart and to the lungs, the great organs of circulation and respiration. The fibres are from the vagus, and through the cervical ganglia form the second, third, fourth, and, perhaps, first and fifth thoracic ganglia. It is for this reason that such a large part of osteopathic treatment is directed to these two regions, the cervical and the upper dorsal.

Impulses carried.

The functions of the fibres in this plexus are: Augmentor fibres to the heart, vaso-constrictors to the

coronary arteries (through vagus), vaso-constrictors to the pulmonary and bronchial blood vessels, sensory fibres to the pleura and lungs, first to fifth dorsal; sensory fibres to heart and pericardium, second to fifth dorsal. The sympathetic fibres may be reached at the middle or inferior cervical ganglion at which point steady pressure will retard the rate of heart-beat, and dilate the pulmonary arterioles. The same effect is produced by relaxing contracture in the interscapular region. By this treatment the heart is strengthened in two ways; resistance in lung is removed, and rate of beat is retarded.

Pain in pleura, pericardium, lungs or heart may be assuaged by pressure applied in the interscapular region — first to sixth dorsal.

From the pneumogastric the cardiac plexus receives fibres to the heart, depressor, inhibitory, vaso-constrictor, motor or constrictor fibres to the bronchioles, sensory fibres to the mucous lining of the air tubes.

Solar plexus.

The *solar plexus*, which on account of its complex connections and size, Byron Robinson calls the "abdominal brain," lies on the aorta just back of the stomach in the interval between the points of origin of the phrenic and renal arteries, practically surrounding the origin of the cœliac axis and the great mesenteric artery. From this great ganglionic mass there are

numerous branches given off accompanying the aorta and its divisions to all the abdominal viscera, forming secondary plexuses named after the arteries along which they pass: cœliac, superior mesenteric, suprarenal, renal, spermatic, aortic, etc.

This plexus is formed of fibres from the great splanchnics, the lesser splanchnics and from the right pneumogastric. The least splanchnic enters chiefly into the formation of the renal plexus controlling the kidney. These fibres are from the fifth to ninth or tenth thoracic ganglia and are the vaso-motor fibres to the stomach, intestines and glands of the abdomen, viscero-inhibitory fibres to the stomach and intestines, and secretory to the glands connected with alimentary tract. In addition the splanchnics carry the impulses of general sensibility and pain. The vagus contributes to this plexus viscero-motor impulses which through it reach the stomach and intestine as far down as the sigmoid flexure; sensory fibres from the mucous lining are carried by the vagus. The vagus is the motor nerve to all portions of the stomach — fundus and pyloric portion including the sphincter pyloric.

Subsidiary plexuses formed from solar.

The solar or epigastric plexus continues downward as strands of fibres on either side of the aorta, cross the common iliac arteries and form a plexus lying in front of the lowest lumbar vertebra. Into this plexus

enter the fibres from the adjacent lumbar ganglia forming the hypogastric plexus. From this are formed chiefly the various plexuses which are distributed to the pelvic organs. The pelvic plexuses lying by the side of the rectum serve as relays from the hypogastric and are increased by spinal branches from the third and fourth sacral nerves, rarely by the second.

The fibres from this plexus differ in their distribution with the sex, but we should ever remember that in the female we get the fibres through the lower lumbar and sacral region to the vagina, uterus, ovary and tubes, and in man to the corresponding organs.

Again from this source fibres are distributed to the bladder and rectum — facts of peculiar interest to us in the many cases of bladder trouble, constipation and piles. The fibres to the vagina and to the bladder are peculiarly rich in the continuation of the spinal branches from the sacral nerves.

Function of hypogastric plexus.

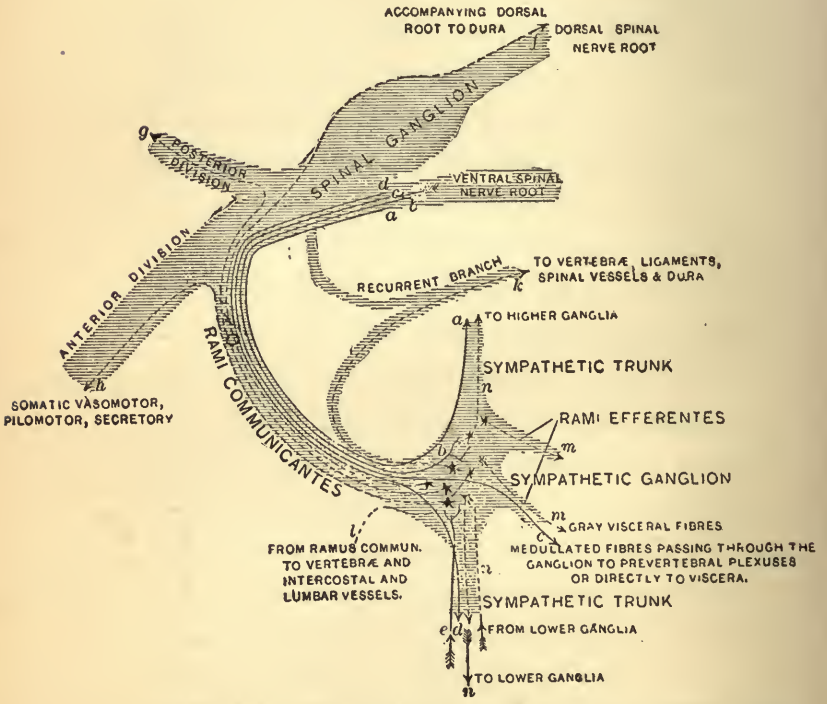
The functions of the hypogastric plexus briefly are these: vaso-constrictor to pelvic viscera from aortic plexus and from upper lumbar ganglia; viscero-inhibitor from lumbar to rectum; viscero-motor. The hypogastric plexus contributes vaso-constrictor and viscero-inhibitor fibres. Through the hypogastric plexus pass sensory impulses from the pelvic viscera.

The sacral nerves furnish to the pelvic plexuses, motor nerves to hæmorrhoidal plexuses of rectum, motor nerves to the vesical plexus controlling the walls of the bladder, sensory and motor fibres to bladder pass from second and third sacral, some sensory passing into hypogastric plexus and out to lumbar ganglia. The lower portion of the ureter is supplied by these nerves as well as the vas deferens and the vesiculæ seminalis. The prostatic plexus receives its vaso-constrictor fibres from the first and second lumbar via the white rami to lumbar ganglia, thence to pelvic plexus.

The vaso-dilator fibres to this plexus from the second and third sacral — the nervi erigentes. These nerves, the visceral or splanchnic branches of the sacral nerves, *do not* pass into the sympathetic ganglia, but pass to the plexuses and to the viscera direct. From the prostatic plexus they pass to the erectile substance of the penis as the cavernous nerves, where they mingle with sensory fibres from the pudic.

The vagina receives fibres from the second and third sacral, both motor and vaso-dilator. Stimulation of these serve as constrictors of the vagina, and produces turgescence of the vulva. The uterus is supplied almost exclusively by fibres from the hypogastric plexus. From this source it receives vaso-constrictor

and viscero-dilator fibres. Constrictor fibres to the neck of the uterus pass to it from the first and second sacral. Its sensory fibres are through the hypogastric plexus and the lumbar nerves, chiefly the second and third.



PLAN OF A LATERAL GANGLION OF THE SYMPATHETIC CORD AND ITS CONNECTIONS.

Medullated fibres represented by continuous lines, non-medullated fibres by interrupted lines.

—(From Gerrish's Anatomy.)

CHAPTER IV.

VASO-MOTORS.

IN A WORK explaining the laws of physiology upon which the science of Osteopathy rests, the vaso-motor nerves contributing as they do a powerful influence to the circulation of the blood, are entitled to a full consideration. These fibres are, in their effect, of two kinds: vaso-constrictors or those whose activity decreases the lumen of the blood vessels, and vaso-dilators whose activity dilates the arterioles, increasing their lumen.

The vaso-motor center.

This vaso-motor control is primarily a function of the cerebro-spinal system and is associated with certain cells situated in the medulla or bulb, a more or less diffuse center lying on either side of the median line. This bilateral center seems to be associated with the antero-lateral nucleus of Clark and it may be that these cells are the center for the vaso-motors. That there is a center for vaso-dilator impulses in the

medulla has never been proven, so we shall treat this center as if wholly vaso-constrictor in function. It is constantly in action producing tonic or hypertonic effects. The dilators act locally and irregularly producing hypotonic effects. In addition to the general vaso-constrictor center there are subsidiary centers located at varying levels of the spinal cord. These are true vaso-motor reflex centers. Again there are vaso-motor reflexes in the sympathetic centers. These centers control the rhythmic activity of many vessels of the body during health.

Exit and structure of vaso-dilators.

The vaso-dilators are not proven to have any general center, but are supposed to come from centers or cells located in different levels of the cerebro-spinal axis. The dilators then are only local in their action, the vaso-constrictors are both local and general.

The dilators make their exit from any portion of the cerebro-spinal axis. The constrictors pass from but a limited portion of it — that portion lying between the second dorsal and the second lumbar inclusive.

All the vaso-dilators are medullated fibres until their distribution to the vessels. They may pass through the sympathetic ganglia, in which case they continue through it as white rami efferentes. They may, on the other hand, pass from the cord with the anterior nerve root or their homologues in the brain

and with it enter into the spinal nerves, following chiefly the motor fibres to be distributed to the blood-vessels of the muscle supplied by the nerve.

The vaso-dilators are spinal nerves and lose their sheaths only on the vessels whose walls they effect. *Vaso-constrictors.*

The vaso-constrictors also begin as spinal nerves, connected directly or medially with the cells in the bulbar vaso-motor center, and they make their exit from the spinal cord as medullated fibres through the anterior roots of the spinal nerves from second dorsal to second lumbar and run as white rami communicantes to the ganglia of the lateral chain. They never leave the chain as medullated fibres but may pass either upward or downward in the chain before losing their sheath in the ganglia. An example of this is seen in the vaso-motors of the head, face, etc., which emerge from the spinal cord in the second, third and fourth spinal nerves, and entering the gangliated cord pass upward to the superior cervical ganglion, in which they end.

From the lateral ganglia all the vaso-constrictor impulses are carried over pale or sympathetic fibres. These may follow in their distribution any of the pathways of the gray rami communicates (Chap. III, page 65) or they may pass *directly* to the viscera or

indirectly as gray rami efferentes through the prevertebral plexuses to the viscera.

The osteopath uses the vaso-motor nerves perhaps more often than any other nerves of the body. Aside from these there has never been any unequivocal proof of the existence of trophic nerves and they are in function closely associated with secretion. Their disturbance interferes with the function of every gland and tissue in the body. The effects of their activity are twofold, local and general. The action of the vaso-constrictors tends to increase the resistance to the blood passing from the arteries into the capillaries and into the veins. This effect will increase the work thrown upon the heart. This effect will be proportionate to the degree of constriction and the area affected. Its maximum effect would be produced if the whole arterial area were affected. Its minimum effect is witnessed when a small area is affected. The increased amount of work may be counter-balanced by the action of a nerve which runs within the vagal sheath — the depressor nerve — a nerve which conveys sensory impulses from heart to vaso-motor center, which impulses diminish arterial tone in other parts of the organism, chiefly through the inhibition of the vaso-constrictors of the abdominal splanchnics.

Now the effect of vaso-dilatation is exactly the opposite of constriction — a diminution of blood pressure everywhere. The general fall will be proportional to the area dilated and the amount of the dilatation. But in local dilatation the most marked effect will be a flushing of the capillaries of the dilated area. Just so in local constriction the most noticeable effect will be the pallor of the constricted area. *Effect of vaso-dilatation.*

These changes produce one effect upon the pressure in the capillaries, another in the small arteries and arterioles. To appreciate this it is necessary to remember that the capillary walls consist of plates or cells very sparsely wrapped with connective tissue but containing no muscle fibres and therefore having no vaso-motor control. These cells are capable of expansion and of elastic recoil.

The change in the lumen of the capillary is a passive one. When the firm and muscular walls of the arterioles are contracted they receive the pressure of the blood and resist its surging forward into the capillaries. While the pressure against the walls of the arterioles has remained unchanged the capillaries have received much less blood and therefore are, by the innate elasticity of the epithelioid plates much reduced in lumen. During dilatation of the arterioles

the lateral pressure of the blood must be resisted by the capillaries, hence they are distended.

Constriction decreases capillary pressure.

To put it briefly, constriction of the arterioles decreases capillary pressure; dilatation of the arterioles increases capillary pressure.

Now the vaso-constrictor center is in continual action resulting in arterial tone. Any increase, either general or local, is called hypertonic; any decrease is a hypotonic condition. Arterial tone is the result of the condition of the blood which stimulates the vaso-motor center and of the general relation between the thermogenic and thermolytic centers and the summation of stimuli which stimulate the sensorium from without. These conditions are further affected by the action of the augmentor and the depressor fibres regulating the strength, rapidity and rhythm of the heart-beat. Any stimulation of a sensory nerve will increase the action of the vaso-motors.

There are a few well known facts upon which our treatment is based:

Facts pertaining to vaso-motors.

First. The cervical sympathetics contain afferent fibres which when stimulated excite the vaso-motor center in the medulla.

Second. There is an inverse relation between the vessels of the skin and the deeper parts on reflex stimulation of the vaso-motor centers.

Third. The vaso-constrictors are distributed chiefly to the viscera and to the cutaneous vessels. The vaso-dilators chiefly to the skeletal muscles and to some other local structures and glands.

Fourth. Vaso-motor actions may be inhibited by pressure. Cutting off the impulses which would enter the center may allay the outgoing ones.

Fifth. Usually the rate of heart-beat and arterial pressure vary inversely, a low peripheral resistance is accompanied by a rapid pulse.

Sixth. In addition to the general bulbar center there are subsidiary centers controlling the vaso-motor condition of the various viscera.

Our theory of controlling the vaso-motor condition of the body locally and generally is as follows:

First. By pressure upon the inferior cervical ganglion we decrease the rate of the heart-beat; this decrease is followed by a reflex vaso-constriction.

Second. By varying the pressure put upon the splanchnics the mesenteric vessels are constricted and a reverse condition prevails in the cutaneous capillaries. This is an important point in thermotaxis; it serves to regulate the temperature by irradiation and by evaporation of the product of the perspiratory glands.

Third. Steady pressure at the basi-occiput is usually considered as holding the vaso-motors. What is done is to reduce by mechanical pressure the blood-flow to the brain, to quiet the irritated meningeal nerves and to reduce the pressure in the arterial twigs which nourish the vaso-motor center. This stimulates the over-fatigued center to healthy action, increases arterial tone, and reduces rate of heart-beat by diminishing impulses from the augmentor center situated near the vaso-motor center in the medulla.

Thermogenic center.

Fourth. The thermogenic center is located in the corpus striatum. Pressure on the vertebral artery aided by downward pressure on the carotid sheath will send less blood to this center, aid in its drainage and thus reduce temperature. The splanchnics must be stimulated at the same time to aid in thermolysis.

The following are the vaso-motor centers for the various organs, members and viscera:

Vaso-motor centers for organs.

Head: The superior cervical ganglion.

Throat, tonsils, nose, etc., are reached at the same point.

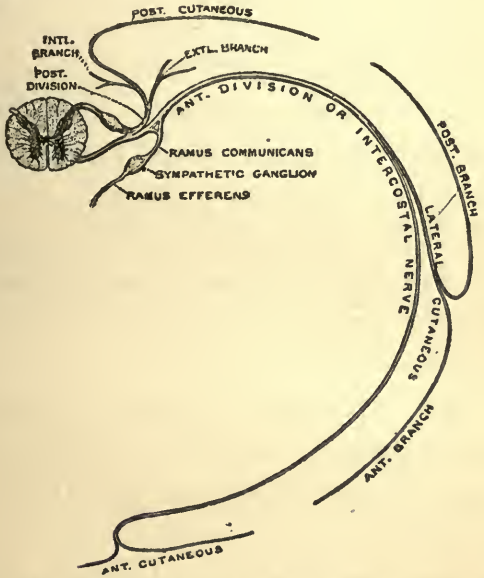
Dilators for tongue and mucous membrane: Fifth and ninth cranial nerves.

Eye: Superior cervical ganglion through fifth nerve.

Brain, anterior and middle fossæ: Superior cervical ganglion. Posterior and middle fossæ: Inferior cervical ganglion.

Muscles of neck: The three cervical ganglia.

Thyroid gland: Middle and inferior cervical ganglia.



PLAN OF AN UPPER DORSAL NERVE, SHOWING THE TYPICAL MANNER OF BRANCHING OF THE ANTERIOR AND POSTERIOR PRIMARY DIVISIONS OF A SEGMENTAL NERVE.

—(From Quain's Anatomy).

All of the above make their exit at the first to fifth dorsal vertebra, hence any lesion in this or the cervical region may affect any of these regions.

Heart: The vagi. We obtain effects on nutrition of heart at the middle and inferior cervical by inhibition.

Lungs: From second to sixth dorsal.

Liver: The splanchnic area, sixth to tenth.

Intestines: Fifth dorsal to second lumbar, a segmental supply in the order duodenum, jejunum, ileum, colon.

Kidneys: Tenth to twelfth dorsal.

Spleen: Ninth and tenth dorsal. Vagus contracts spleen through its action on muscular trabeculæ.

Portal system: Fifth to tenth dorsal.

External generative organs, constrictors: First and second lumbar to sympathetic and to hypogastric plexus, thence through pelvic plexuses or through pudicnerve.

Dilators: First and second sacral via nervi erigentes to pelvic plexuses.

Internal generative organs (both sexes): First and second lumbar.

Arm, vaso-constrictors: Second and seventh dorsal. Vaso-dilators chiefly in motor nerves of the muscles.

Leg: Constrictors, sixth dorsal to second lumbar. Dilators in sheaths of motor nerves.

Trunk: Constrictors, at corresponding segments. Dilators, in motor nerves to muscles usually.

CHAPTER V.

OSTEOPATHIC CENTERS.

THE work of the osteopath is in many cases palliative — always in acute cases and usually as preparatory treatment in chronic conditions it is necessary to reduce muscular contraction. This muscular contraction is in many cases a reflex effect of stimulation of branches of afferent nerves, other branches of which are distributed to the muscles of the spine. According to Head's law (Chap. II, page 49) these contractions are the result of changed conditions in the viscus. To remove these will restore the normal circulation to the organ through vaso-motor effects and tend to restore the organ to health. This contraction is reduced by steady pressure applied to the muscles of the back, usually the deeper layers. The point at which this produces the most marked effect is between the spines and the transverse processes. The pressure should be directed upward,

Sensory centers to viscera.

outward and forward. Quain gives the *sensory* nerve supply to the various viscera as follows :

Heart : First, second and third dorsal.

Lungs : First, second, third, fourth and fifth dorsal.

Stomach : Sixth, seventh, eighth and ninth dorsal. Cardiac end from sixth and seventh. Pyloric end from ninth.

Intestines : (*a*) Down to upper part of rectum, ninth, tenth, eleventh and twelfth dorsal. (*b*) Rectum, second, third and fourth sacral.

Liver and Gall-bladder : Seventh, eighth, ninth and tenth dorsal.

Kidney and Ureter : Tenth, eleventh and twelfth dorsal. Upper part of ureter, tenth dorsal. At lower end of ureter, first lumbar tends to appear.

Bladder : (*a*) Mucous membrane and neck of bladder, second, third and fourth sacral ; (*b*) over distention and ineffectual contraction, eleventh and twelth dorsal and first lumbar.

Prostate : Tenth, eleventh, (twelfth) dorsal, first, second and third, and fifth lumbar.

Epididymis : Eleventh and twelfth dorsal, and first lumbar.

Testis : Tenth dorsal.

Ovary : Tenth dorsal.

Appendages, etc.: Eleventh and twelfth dorsal, first lumbar.

Uterus: (*a*) In contraction, tenth, eleventh and twelfth dorsal and first lumbar. (*b*) Os uteri; (first) second, third and fourth sacral (fifth lumbar very rarely).

Connection of organ and central nervous system.

Osteopathy bases its claim to rank as a science of healing upon the fact that there exists a definite and fixed relation between an organ and the central nervous system. This relation is secured through the segmented arrangement of the spinal nerves or through the sympathetic system, by means of rami communicantes. The order of this innervation is fairly constant, though, as is the case with other portions of the body, it may vary. This variation in no wise invalidates the claim of osteopathy to rank as a science, but it does emphasize the necessity of our searching for lesions even in regions relatively remote from the center. Specific treatment in the sense of work exclusively upon a region said to be a center is rarely indicated. Owing to the diffusion of pain and its attendant conditions, it is necessary to remove any contracture which may be associated with it. Again it sometimes occurs that disease of an organ produces no effect on its usual center, and in such an event it is necessary to carefully examine other regions for the trouble. A case of con-

gested ovary was recently related to me in which there was no soreness in the usual center, eleventh dorsal, nor would persistent treatment directed to this center produce any effect, while a marked lesion was found at the sacro-iliac synchondrosis and the removal by treatment resulted in restoring the normal condition.

"Touching the button."

Know the location of the centers. Know also that occasionally a lesion causing the trouble must be found elsewhere. "Touching the button" is a fascinating method of treating, both in theory and in practice, but the operator must be broad enough to expect it to be difficult occasionally to locate the button.

Reminding you again that our use of the term center is in the sense of a convenient and advantageous place to reach fibres to or from a certain organ, we shall point out some of the more prominent and important centers:

Osteopathic centers.

The atlas is associated with disturbances to the vaso-motors of the eye, ear, and with eczema and other diseases of the face.

The axis and third cervical is a general vaso-motor center, the superior cervical ganglion, center for side of head, face, eye, nose, pharynx, tonsils and vessels of the brain.

Third, fourth and fifth cervical, origin of phrenics, center for hiccoughs.

Fifth and sixth cervical, middle cervical ganglion; center for thyroid gland; also augmentors to heart through middle cervical ganglion.

The general function of the cervical region is that of (1) vaso-constrictor effect through sympathetic fibres passing into it from below through the second, third, fourth and fifth dorsal, and vaso-dilator fibres in the cervical spinal nerves, thus affecting all parts of the body; and (2) local vaso-motor effects on the neck, head and face of the same side. That the upper cervical region is sometimes said to be a center for the kidney is based upon its influence over the general vaso-motors of the entire body.

Second, third, fourth, fifth and sixth dorsal are vaso-constrictors to the pulmonary blood vessels.

Third to seventh dorsal, vaso-motors to arm via the brachial plexus.

Seventh cervical and first dorsal, inferior cervical ganglion, heart, thyroid gland, vertebral and basilar arteries.

Annulus of Vieussens and second, third, fourth and fifth dorsal, augmentory fibres to the heart.

The first three give regularity of rhythm.

Fourth and fifth control intermittency and regularity of heart-beat.

Fourth dorsal, sometimes third or fifth, stomach center on right side usually. General effect as low as the eighth.

Second and third dorsal center for ciliary muscle, also muscle of eye. Center for vomiting.

Sixth to tenth dorsal, origin of the great splanchnic, carrying viscero-inhibitory fibres and viscero-constrictor and secretory fibres to the stomach and small intestine.

Eighth, ninth and tenth dorsal on right side, center for the liver. This gives us the center for chills, as the liver and spleen are implicated in malarial attacks.

Ninth and tenth dorsal on the left, center for the spleen. In treatment of chills the general condition must be controlled through cardiac and vaso-motor centers, directing especial attention to the liver and spleen. Also center for uterus via hypogastric plexus.

Eleventh and twelfth dorsal and upper lumbar, the small intestine and kidney.

Eleventh and twelfth dorsal, center for ovary.

Second lumbar, center for parturition, micturition and uterus.

Second, third and fourth lumbar, center for diarrhœa.

Fourth and fifth lumbar, hypogastric plexus, which with fibres from the aortic plexus forms the pelvic plexus distributing fibres to the pelvic organs.

The anterior division of the sacral nerves are splanchnic in function and are distributed to the rectum, to the bladder, sphincter ani, vagina and uterus. These seem to be chiefly viscero-motor in function.

Second and third sacral, bladder.

Fourth sacral, vagina.

Fourth and fifth sacral, sphincter ani.

Control of circulation

After a general view of the centers along the spine it is necessary to form a résumé of their location by mentioning the chief organs of the body and with them the regions in which they may be affected through their vaso-motor and viscero-motor, inhibitory and secretory nerve supply. Generally speaking the circulation is controlled through the great vaso-motor centers, reached in the upper cervical region. It is further controlled through the region from which the augmentor fibres make their exit — the second to the fifth dorsal. It is also affected by treatment in the splanchnic region controlling the vaso-motors to the great capillary network of the mesenteries.

That the respiratory activity is closely affected by the circulation is known to everyone, so a treatment affecting the one in a measure modifies the other. So far as is known there is no center for voluntary motion other than the exit of the motor nerves along

the spine. (The physiological center is in the encephalon.)

A spinal lesion may cause a paralysis of all the motor apparatus below that lesion, or, if the lesion affect a small area of the cord transversely, its effect may be limited to a few muscles or to a few groups of muscles in a region whose motor nerves pass through the affected region.

Nutrition is likewise dependent upon respiration, circulation and the condition of the stomach, intestines, liver, etc., so a center for nutrition is consequently not to be sought for in any one region.

The practical value of the foregoing facts is this: If the symptoms indicate trouble or disturbance of a certain organ, look carefully for lesions in the corresponding spinal center. Should other symptoms not permit of a differential diagnosis, as is often the case, then the existence of a lesion at the center for an organ will be an almost infallible evidence of disease of that organ.

In case of a disturbance in any of the following organs or members look for your spinal lesions as follows:

Pharynx, larynx and tonsils: Second and third cervical.

Thyroid gland: Fifth and sixth cervical; general vaso-motor and cardiac center, seventh cervical and first dorsal — head of first rib; clavicle. *Center for thyroid gland*

Arm, motion, vaso-motor and nutrition: Brachial plexus in fifth, sixth, seventh, eighth cervical and first dorsal. Also vaso-motors in third to seventh dorsal.

Lungs and bronchi: Second to sixth or eighth dorsal; also vagus nerve.

Heart: Fibres from second to fifth dorsal, special attention to fifth dorsal. Heart may also be reached through middle and inferior cervical ganglion, and at first rib, or annulus of Vieussens.

Stomach: Third to fifth dorsal specific on right side, third to eighth generally; also vagus.

Liver: Ninth and tenth dorsal, vaso-motor, vagus motor.

Spleen: Eighth to eleventh dorsal, vaso-motor, vagus motor.

Duodenum: Great splanchnic, sixth to tenth dorsal.

Jejunum and ileum: Lower dorsal and lumbar to fourth and fibres from solar plexus.

Colon: Second to fifth lumbar. Also fibres from solar plexus.

Rectum: Second to fifth lumbar via inferior mesenteric plexus, inhibitory. Sacral, via hypogastric plexus, motor; also third and fourth dorsal.

In the treatment of the abdominal viscera in addition to the specific treatment it is always beneficial to give direct treatment to the abdomen, paying particular attention to the region of the solar plexus. This has the effect of changing the blood by sheer compression, thus relieving venosity and allaying increased peristalsis; or in case of sluggishness of any organ it stimulates the plexuses of Auerbach and Meissner, to motion and secretion. It may also break up masses of fecal matter lying within the abdominal canal.

Uterus: Second to fifth lumbar, ninth and tenth dorsal.

Genitalia generally: Second to fifth lumbar.

Bladder: Second, third and fourth sacral.

Sphincter ani: Fifth sacral.

The knowledge of the location of these centers is of incalculable advantage to the osteopath since it is upon this knowledge that the accuracy of his treatment depends, and since so much of the osteopaths' success is dependent upon the accuracy of his diagnosis this must be available knowledge. An osseous lesion in the area which we have designated as a center for a certain organ may lead to a diseased condition of that organ; while a lesion of an organ may manifest itself in tenderness within its center

along the spine. This tenderness may be found in the following localities:

1. On the ends of the spinous processes, usually indicating an anterior condition.

2. Above the spinous processes and about an inch lateral at the articulation of the rib with the transverse process of the vertebra, indicating a lateral movement and often a tipping forward of the body of the vertebra.

3. The soreness may be manifested at the angle of the rib, indicating a rotation of the rib upward or downward on the axis connecting its two extremities. *Location of tenderness.*

4. Associated with any of these three conditions may be found soreness in the muscles lying in that region on either side of the spinous process.

To determine these conditions the patient should be sitting.

Gentle pressure will determine any sensitiveness. To examine the angles of the ribs in the interscapular region the arm on the same side should be grasped at the elbow and firmly passed across the chest. This will tighten the muscles and expose the rib from the covering of the scapula. In all these cases the muscular contraction must be released; to do this the patient should be placed upon the table and a firm and steady pressure applied to the muscles, the skin being

lax, passing either upward or downward. This will release the pressure and may be sufficient in acute cases. In addition to this, an oscillation of the body from side to side bending at the lesion will prove helpful, as will rotation around the same point. Springing the spine forward will produce a good effect by releasing muscular and ligamentous contractures.

CHAPTER VI.

THEORY OF THE TREATMENT OF THE SPINE.

SINCE so large a part of our treatment is directed toward the seat of the trouble via the spinal nerves, it is necessary that we defend ourselves and our science by rationally explaining the *modus curandi* of osteopathic manipulations. It is necessary to recall to mind the relation of the central nervous system to the sympathetic through the rami communicantes, and also the function of the sympathetic in distributing secretory, nutritive, sensory viscero-motor and vaso-motor impulses. Leaving out all disputed points we take the primary facts upon which all physiologists and anatomists are practically agreed, viz. :

(1) That from the entire length of the cerebro-spinal center vaso-dilator fibres make their exit.

(2) That the vaso-constrictors are confined in their exit to the region of the cord lying between the second dorsal to the second lumbar inclusive.

(3) That the viscero-motor go largely through the vagus nerve to the stomach and intestines.

(4) That the sympathetics are the great vaso-constrictor and viscero-inhibitors to the solar and related plexuses.

(5) Sensory fibres from the viscera pass through the sympathetics to the spinal nerves.

(6) *Inhibition* of nerve action may be procured *reflexly*. Pressure on one branch of the nerve will quiet pain in other branches.

Non-aerated blood an stimulat to peristalsis.

(7) The motor, vaso-motor and secretory conditions of a viscus are controlled by the condition of the nerve center controlling that organ; hence affecting the sensory nerve affects the viscus.

It is necessary to remember that *non*-aërated blood is the greatest stimulant to peristalsis; pain and cramping are often only an evidence of increased peristalsis.

Any change in the blood supply to the stomach and intestine has its direct effect upon the nutrition of the body, influencing both digestion and absorption; also it has its effect on excretion through the kidneys. Thus it is plain that the region that controls nutrition and excretion is of vast importance in regulating the general welfare of the organism.

Dr. L. Hart's theory was as follows: "Through stimulation of vaso-motors distributed to the vessels in the muscles along the spine we produce a constriction of these peripheral vessels which thus increases the pressure in the collateral branches of these arteries, increasing the pressure of the blood in the vessels within the cord itself." *Dr. Hart's theory.*

This treatment is, according to Dr. Hart's theory, directed toward regulating the blood supply to the nerve cells within the spinal cord, and through overcoming hyperæmia or anæmia of the center restore normal functioning to both nerve and organ with which it is anatomically connected.

Another theory which seems much more in accord with our immediate results obtained in acute cases or in giving immediate relief to exacerbations of pain is here given. *Another theory.*

Our theory is this: First, we inhibit the passage of afferent impulses by pressure on the posterior sensory portions of spinal nerves. This reduces the impulses sent in, quieting the pain by quieting the center. We reduce muscular contractions which have irritated both efferent and afferent fibres to the viscera. These contractions have caused a venous stasis in the capillaries of the muscles themselves irritating the posterior sensory nerves which reflexly affect the viscera.

We remove irritation from the vaso-constrictors allowing normal blood supply to be re-established. We stretch the connective tissue and take off pressure from the nerve trunks. We equalize the nerve tension between center and periphery.

In order to appreciate this theory it is necessary to grasp the philosophy of transferred or sympathetic pains. This is a fact long known to the medical profession though poorly utilized by them in diagnosing disease. Investigations by Head prove that in diseases of internal organs manifestations of this condition will be made by tenderness in widely removed parts, the diseased organ and the region manifesting the tenderness having a fixed relationship. Thus toothache may cause pain in the ear, heart trouble may cause a localized pain between the shoulders, kidney trouble manifests itself by pain in the back. Careful investigation will reveal the fact that the soreness is not in most instances associated with the skin alone but that the tenderness is found in the muscles beneath. Head explains the topo-

Head's law.

graphical association of tenderness with visceral disorders by the assumption that the nerves supplying the regions thus related have their origin within the same segment of the spinal cord. The viscera are regions of low sensibility while the skin and muscles

are more freely supplied with sensory fibres and may be called regions of high sensibility. The sensory result of visceral irritation or lesion is summarized thus: "When painful stimulus is applied to a part of low sensibility *in close central connection* with a part of much greater sensibility, the pain produced is felt in the part of higher sensibility rather than in the part of low sensibility to which the stimulus was actually applied." This law is proved both by experiment and clinical practice. But clinical observation further shows that the converse of that proposition is true. Constant irritation or stimulation in a region of high sensibility in close central connection with a viscus will produce both functional and structural disturbance in the viscus as well as sensitiveness in the region stimulated. That such stimulation exists cannot be doubted. Trauma may produce slips or minor dislocations. Anæmia allows a relaxation which will favor such conditions. Cold, constant labor, overwork, general excitement may produce muscular contractions which often remain permanent. Thus osseous, ligamentous or muscular pressure may serve as a stimulus, which, having its first effect on a region of high sensibility, will soon manifest itself in some irregularity of the organ. Then the radical treatment will be to remove the irritation by over-

coming muscular contraction, or pressure upon the nerve from whatever source. That a muscle devoid of irritation may be made to contract is a simple physiological fact easily proven. That steady pressure accompanied by a stretching motion forcibly applied to a contracted muscle will cause it to relax is also proven in osteopathic practice daily. Again it is a physiological axiom that prolonged stimulation of a nerve causes it to fail to function; hence, irritation of a nerve, the result of contracture, ultimately causes loss of tone to and function of the organ supplied by that nerve,—or, in other words, prolonged stimulation serves to inhibit.

In conditions of anæmia of an organ, contraction of muscles and tenderness of superficial nerves coming from corresponding segments of the cord are always found.

Now, our chief object, if the foregoing statements are correct, is to relieve contracture, and whether the condition be one of anæmia or hyperæmia the removal of this condition will allow a restoration of the normal condition. This explains why one often obtains the same result from a stimulating treatment as from an inhibitory one.

The case is markedly different in the cervical region where one may apply direct stimulation or inhibition

to the sympathetics and to the vagus for the heart and viscera.

Direct effect in cervical and sacral regions.

It is also different in the sacral region, for there you work on the posterior division of the sacral nerves while the anterior division is splanchnic in function and distribution, thus allowing a more direct effect without any intervention of the sympathetics.

First. We correct osseous lesions which have interfered with any of the classes of nerves to the disturbed viscus.

Second. Immediate effects are produced by reducing muscular contractures which have irritated the somatic branches of motor, sensory, vaso-motor and secretory nerves to the viscera. Irritation removed, the nerves return to normal.

Third. Steady pressure on the posterior divisions of the spinal nerves inhibits sensory, and vaso-motor impulses to and from the center, thus retarding all forms of activity. Rapid alteration of pressure increases activity of the organ thus increasing impulses to it.

Fourth. Steady pressure may restore visceral life by removing muscular contracture which has served as an inhibition.

THE EXAMINATION OF THE SPINE.

That we may intelligently examine a spine we should be thoroughly acquainted with the general topography of the back. I shall after Holden give you a brief outline of the landmarks of the back. It must be remembered that the normal spine has four curves, as follows: (1) The cervical, concave backward, extending from the apex of the odontoid to the second dorsal. (2) Beginning at the middle of the second dorsal and extending to the twelfth, its concavity forward is the dorsal curve. The most prominent point is at the seventh and eighth dorsal. (3) The lumbar curve, from the middle of the twelfth dorsal down to the angle between the fifth lumbar and the base of the sacrum, its concavity being directed backward. (4) From the base of the sacrum to the tip of the coccyx, its concavity forward, is the pelvic curve.

The spinal curves.

Care must be taken to become thoroughly familiar with the normal in order that any variation from this type may be detected. There will be variations within a limited range, even in health. The dorsal and pelvic curves are primary and are due to the shape of the vertebræ, while the cervical and lumbar are secondary and compensatory and exist only after birth, their existence being due to modifications in the form of the intervertebral discs. There is one point

in which the beginner is apt to be deceived, particularly in the female. The lumbar curve beginning at the sacro-vertebral articulation, drops forward very abruptly and if this should be further increased in appearance by well developed nates, the operator may be deceived. The test must be made by a careful examination for tenderness on pressure. The spine should lie in a perpendicular plane while the patient is sitting or standing erect, though there is often a slight lateral curvature in the dorsal region, the convexity of which is directed toward the hand which is habitually used. This is doubtless caused by the increased strength of the muscles of that side and also the compensatory position taken by the head and cervical region. Again the tips of the vertebral spines should lie in a perpendicular plane, which may be tested by bringing the hand briskly down over the spines either directly over it or with two fingers, one on each side of the prominences of the spines. By this method one may detect any deviation from the usual position, and if tenderness be present this may serve as an evidence of a lesion, and reasoning from cause to effect, the organ or organs affected may with certainty be determined. But care must be used in the matter of finding a lesion. The atlas has no spine, only a mere tubercle and no surprise should be

manifested at finding it "forward." The second cervical is perhaps the most prominent feature in the cervical region of a normal spine and its widely bifurcating and massive spinous process may give the beginner some uneasiness. The cervical spines are bifid from the second to the sixth inclusive. The vertebra prominens is close to the first dorsal, the latter very commonly being mistaken for it.

Indications.

To examine, bare the spine, have the patient sit erect. Note the curves whether they be normal, diminished or accentuated. A flat region in the upper dorsal means lung and heart action impaired, and weakened vitality. If the fifth to tenth dorsal are anterior, or if the lumbar, dorsal and cervical are almost in line there will be stomach and intestinal disorders. Any marked deviation from the normal curve in the lumbar region may result in constipation, ovarian or uterine disorder, or it may cause derangement of the function of the bladder. The sacral vertebra are relative to each other always in place but they may be slightly out of their true articulation with either the auricular processes of the ilium or with the lumbar vertebra above or the coccyx below. In lesions of the lumbo-sacral and sacro-iliac articulations you will find pelvic disturbances. The coccyx may by dislocation cause constipation, hæmorrhoids

and piles. Detect any lateral curves that may be present by careful inspection. Friction will bring into view the spines and any marked separation or deviation from the perpendicular, the patient sitting erect, should call for careful palpation.

Locate the second cervical by its prominence. The first dorsal by the length of its spinous process. The third dorsal by the level of the scapular spine. The seventh dorsal by the angle of the scapula. The fourth lumbar by the fact that a line from the iliac crests will pass through its body. *Landmarks.*

The twelfth dorsal may be conveniently located by having the patient fold his arms and lean forward thus throwing into prominence the trapezii, whose converging external borders will indicate the twelfth spine or better by the articulation with the last rib or by the natural break between it and the first lumbar. After being satisfied with inspection, a careful examination with the hand will detect any irregularity that the eye may overlook. The spines are the key to the situation, but the tenderness in addition to abnormal position must be found.

Each operator will have his preference for position of the patient. For a thorough examination many positions may be necessary. The following order is suggested, the back being exposed in all cases : *Positions for examinations.*

First. Patient sits *erect*, operator standing behind.

Second. Patient leans forward, sitting squarely, hands on knees.

Third. The patient is placed facing operator, first on right and then on left side. The operator carefully examines each spine and transverse process in succession. During this examination the patient must thoroughly relax. The operator uses arms and legs of patient as levers for movement in examination.

Fourth. Patient on back, body straight so that nose, chin and point between feet are in straight line, arms at sides. The operator now stands at head and examines both sides of vertebræ of neck. The *spines* of cervical vertebræ cannot be relied upon for diagnosis so we examine transverse processes. Deviation from a straight line either antero-posteriorly or laterally indicates trouble at that point. An examination of its spine will usually confirm this result. The atlas can be examined only at its transverse process which should be easily felt about half way between mastoid process and the decending ramus of the inferior maxilla. Tenderness is usually, if not always, most pronounced on the side of the slip. The end of the little finger may usually be passed between the transverse process and the ramus of the jaw if in normal position.

CHAPTER VII.

REGIONS OF HEAD AND THORAX.

THE covering of the upper part of the head is called the scalp. It consists of skin over an aponeurosis of the occipito-frontalis muscle, which becomes muscular in front and behind. The chief bony prominences are the occipital protuberance behind, the mastoid process just behind and on a level with the lobule of the ear, and the zygoma.

Arteries and nerves for scalp.

The arteries of the scalp are the supraorbital, making its exit at the supraorbital notch; the temporal from the external carotid passing up in front of the ear, distributed to the anterior and middle part of the scalp; the posterior auricular to the posterior part of the scalp passes posterior to the apex of the mastoid process the occipital from the external carotid.

The nerves supplying sensory fibres to the scalp are the supratrochlear, reached at the inner angle of the orbit, the supraorbital reached above the supraorbital

notch, the temporal branch of the tempo-malar halfway between the eye and upper margin of ear, and the auriculo-temporal best reached in front of tragus. These are all branches of the fifth nerve. In addition the small occipital and great occipital innervate the posterior portion of the scalp. These are both from the second cervical and may be reached at their exit.

These nerves are frequently affected in headaches. Pressure at the points named will relieve this condition.

The muscles of the face, excepting those of mastication, are supplied by the seventh nerve. This nerve makes it exit from the stylo-mastoid foramen, anterior to the mastoid process, and may be reached between the mastoid process and the ramus of the jaw.

Fifth nerve.

The sensory nerve of the face is the fifth, supplying also the muscles of mastication. This nerve is affected in neuralgia and is treated by steady pressure at the following points: At the supraorbital notch and at the infraorbital and mental foramina. A line passed from the supraorbital notch to a point between the two bicuspid teeth will pass through these points. Indirectly it may be reached through its sensory distribution from Meckel's ganglion, lying in the spheno-maxillary fossa.

The arteries to the face are, the facial and branches from the temporal. The facial may be felt as it crosses the horizontal ramus of the lower jaw.

The mouth requires much attention in disease. The points which the osteopath may reach within this are the uvula, in the middle line posteriorly, the posterior nerves to be reached and pressed upon in catarrh, the tonsils latterly between the anterior and posterior pillars of the fauces.

The pits into which open the Eustachian tubes may be reached in the posterior and lateral portion of the pharynx. The ninth nerve supplies the tonsils, part of pharynx, Eustachian tube and tympanum with sensory fibres. Treatment of this nerve is necessary in catarrhal deafness.

The neck.

The neck is one of the most important regions of the body to the osteopath. Its drainage is accomplished largely through the external and the anterior jugular veins, the former in line from the angle of the jaw to the middle of the clavicle, the anterior lying in front of the sterno-cleido-mastoid. The internal carotid lies in the carotid sheath, extending from the mastoid process to the inner end of the clavicle. The first two mentioned are superficial and pulsate in case of tricuspid incompetency. In the neck, in front, lie the trachea, the larynx, the hyoid bone, the latter felt just on a level with the inferior maxilla.

Beneath the sterno-clavicular joint lie the innominate veins, the common carotid on the left and a division of the innominate on the right. Rising into the neck may be felt the subclavian artery.

The important muscles in the front of the neck are the sterno-hyoid and sterno-thyroid. At the side is the sterno-cleido-mastoid, while deeper lie the scaleni, the rectus capitus anticus major and minor, and the longus colli. Contracture of these muscles is often an interference to drainage of the organs in the head and neck. The muscles in the posterior portion of the neck, which the osteopath is called upon to relax, are trapezius, levator anguli scapulæ and the rhomboids. More deeply lie the serratus superior and splenius. Beneath these are the muscles which correspond to the erector spinæ and still more deeply are the complexus, the rectus capitis posticus major and minor, and the obliquii. Deep in the neck may be felt the transverse processes and their corresponding spines. Superficially in the middle line behind, is the ligamentum nuchæ. This may be stretched by holding the trunk and pushing the head and neck downward and forward.

Contracture interferes with drainage.

The vertebral artery may be compressed as it passes over the atlas just beneath the base of the skull. This is a point useful in treating headache.

For examination the thorax is divided into four regions, anterior, posterior and two lateral.

Anterior thoracic region.

The anterior is surrounded by a line passing through the upper ring of the trachea, horizontally to the sterno-cleido-mastoid, thence to the inner end of the outer fourth of the clavicle. From this point it is bounded laterally by the anterior axillary line, which, extending downward, passes through the point

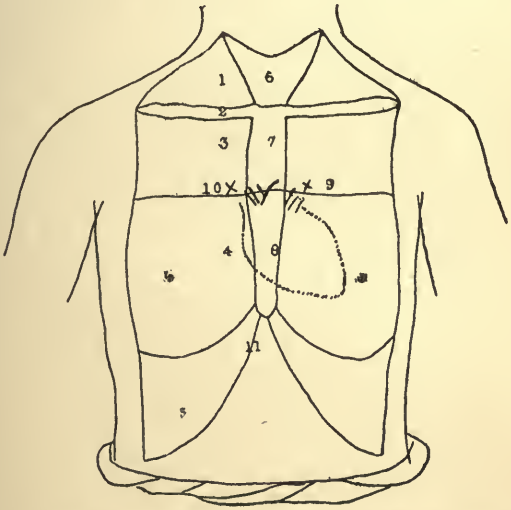


DIAGRAM SHOWING SUBDIVISIONS OF THE ANTERIOR REGION OF THE THORAX.

(1) Supra-Clavicular.
(2) Clavicular.
(3) Infra-Clavicular.
(4) Mammary.
(5) Infra-Mammary.
(6) Supra-Sternal.
(7) Superior Sternal.
(8) Inferior Sternal.
(9) Area for Pulmonary sound.
(10) Area for Aortic sound.
(11) Area for Tricuspid sound.

Mitral sound is heard at point of cardiac impulse over apex of heart.

at which the pectorales muscles leave the chest, ending at the lower margin of the twelfth rib. Inferiorly it is bounded by the inferior margin of the twelfth ribs and lower end of the sternum. This area is subdivided into a middle portion by the sternum and that region lying within the sterno-cleido-mastoid muscles above the sternum inferior to the line forming the superior boundary of the anterior area.

Supra scapular region.

That portion of the middle region lying above the sternum is called the suprasternal region. It contains the upper part of the œsophagus and the trachea. Within this area also lies the vagi nerves, the common carotid arteries and the jugular veins, three very important structures. The phrenic nerves may be reached in this region as they pass into the thorax beneath the sterno-cleido-mastoid muscles. The sterno-hyoid and sterno-thyroid muscles are within this space and lie anterior to a most important structure,—the thyroid gland. This body lies on either side of the trachea and is connected by a bridge of glandular structure covering the second, third and fourth tracheal rings. The lateral lobes of the gland lie upon the inferior constrictor of the pharynx superiorly, and lower lies upon and external to the trachea. Posterior to it lie the carotid sheath and the inferior thyroid artery and the recurrent laryngeal nerve.

The lower portion of the gland lies beneath the omo-hyoid, the sterno-hyoid and the sterno-thyroid muscles. This gland is of interest to the osteopath in goiter. The muscles above mentioned are contracted in case of enlargement of the gland. The veins draining this structure are the superior and middle thyroid veins emptying into the internal jugular, and the inferior thyroid emptying into the innominate. The arteries supplying it are the superior thyroid from the external carotid, the inferior thyroid from the thyroid axis of the subclavian artery and occasionally a branch from the innominate or the aorta, the media or thyroidea ima. Its nerves are from the middle and inferior ganglia of the cervical sympathetic. On account of the exceedingly rich vascular supply to this organ and its peculiar relation to vaso-motor disturbances, treatment should be toward regulating the vaso-motor through the cervical region. There may be physical obstruction to the drainage through the muscular contractures. Or there may be compression of the subclavian artery owing to a depressed clavicle, or an elevated first rib. Careful examination should always be made of the head of the first rib in such a case, as tenderness there may indicate it is turned.

Thyroid gland.

To the structures lying within this region let us add the apex of the lung extending an inch above the clavicle, lying deep behind the sterno-mastoid and sterno-thyroid muscles. This portion of the lung is peculiarly liable to tubercular infection and should be carefully examined. The laryngeal nerves are also reached in this region.

The superior sternal region is of comparatively little importance from the osteopathic standpoint, save in diagnosis. It is separated from the inferior sternal region by a line drawn on a level with the upper margin of the third rib.

The inferior sternal region corresponds to that portion of the sternum lying below the line above mentioned. Covered as are these regions, they are difficult to reach, and it is through spinal treatment that the osteopath secures his results. In the superior sternal region the vena cava descendens, the pulmonary artery and the bifurcation of the trachea are found, while the lung tissue encroaches upon this area below the level of the second costal cartilage.

In the inferior sternal region are found a portion of the right auricle, the beginning of the aorta, and the pulmonary artery. The right ventricle lies largely within this space, while both lungs, the left and the right, and the liver contribute to filling it. There

may be malformations of the sternum as a result of dress, occupation, or a rachitic condition in early childhood. Very little can be done to overcome this condition, though by pressure on the sternum and traction on the lateral thoracic walls by means of the pectoral muscles, the lateral diameter of the chest may be increased. This treatment may be very effective if administered in the early stages of the disease.

Supra-clavicular region.

In the supraclavicular region is an important structure, the subclavian artery. Its pulsations can be seen and felt near the outer border of the sterno-mastoid muscle, about an inch above the clavicle. We may desire to compress the artery in this position just as it crosses over the first rib. It is here that we may reach the annulus of Vieussens and the trunks of the brachial plexus. To treat this region, it is usually most convenient to stand behind the patient; while the patient sits, with the head slightly inclined toward the side treated. The arm is used as a lever to throw the structures in different relations to each other, thus insuring the effect of the manipulations. In this region the relation of the first rib to the clavicle may be detected. Normally the end of the finger or thumb may be pushed between the two. In case the clavicle is depressed it can be raised by passing the thumb beneath the clavicle near its middle portion and

using the arm as a lever throwing it upward, outwards and forwards there will be felt pressure on the thumb, thus elevating the sternal portion. The operator must remember that the shoulder is easily dislocated and must use due care that no injury is done. A depressed clavicle may obstruct the subclavian vein.

Infraclavicular region.

The structures lying beneath the clavicles and the upper portion of the sternum are of great importance to the osteopath, including the vessels of which we have spoken, the internal mammary artery and the phrenic and pneumogastric nerves.

The infraclavicular regions extend from the lower margin of the clavicles to the inferior border of the third rib and are almost wholly filled with lung tissue. It is here that phthisis usually manifests itself, so that the study of this region is important. There is a marked difference in the position of the two bronchi: the right, larger and more horizontal than the left, enters the lung at the level of the second costal cartilage at its upper border; the left passing beneath the aortic arch, reaches the lung an inch lower, beneath the third costal cartilage. This makes some slight difference in the tympanitic note of these regions. At the point of union of the second rib and cartilage the aortic sound is best heard on the right side, while in the corresponding position on the left side the pulmon-

ary sound is heard. The right infraclavicular region contains lung tissue, the vena cava descendens and the right bronchus. The left side contains lung tissue, the left bronchus and the pulmonary artery, the base of the heart and a part of the ascending, transverse and descending portions of the arch of the aorta. This region often manifests tenderness on pressure in case of diseased condition of the lung and should be carefully examined. The costo-chondral articulations very frequently in such cases show most marked tenderness.

Costo-coracoid membrane.

At the outer extremity of this region, extending downward from the coracoid process to the upper margin of the pectoralis minor muscle is the costo-coracoid membrane. It lies over the subclavian vessels and is pierced by the cephalic vein, acromial thoracic artery and vein, the superior thoracic artery and the anterior thoracic nerves to the pectorales muscles. Its importance cannot be overestimated in cases of rheumatic conditions of pectoral and deltoid muscles, also in drainage to arm and shoulder. The mammary region, extending from the infraclavicular to the inferior margin of the sixth rib, contains lung tissue, while the heart lies within the mammary and inferior sternal and infraclavicular regions. Its base lies almost exactly on the level of the third rib. The apex lies at a point

midway between the mammary and parasternal lines in the fifth interspace, an inch and a half below and an inch median to the nipple. It extends three-quarters of an inch to the right of the sternum. The area of superficial cardiac dullness is confined to the left mammary region. The right side contains in the mammary region the lung, the right auricle and ventricle; the left side, the left lung and the heart.

Infra-mammary region.

The infra-mammary region, lying below the inferior margin of the sixth rib, contains the corresponding lung, on deep inspection, and the corresponding lobe of the liver. The right infra-mammary affords the point beneath its inner boundary for directly stimulating the liver, one of the most potent methods of overcoming torpidity of the liver and curing constipation. To treat the liver at this point the patient should be either on his back or on his left side, the knees and thighs both gently flexed to loosen the wall of the abdominal region; then with the hand placed just internal to the line of the cartilages the patient is told to take a deep breath and then exhale. Synchronous with the exhalation the operator presses forcibly upward and outward. Under the dependent portion of the liver, at a point just below the middle of the inner border of this region, lies the bile cyst, its fundus sometimes extending below the margin of the liver,

under which circumstances it may be easily felt. Pressure and stimulation here tends to empty the cyst by increasing the peristalsis of the cyst, rather than by forcible ejection. The fundus of the stomach lies chiefly within the left infra-mammary region and extends well up into the mammary area, while the pyloric end stretches across and ends under the right, thus placing a part of the duodenum and the hepatic flexure of the colon beneath this area, the splenic flexure of the colon entering the left.

Lateral areas.

The lateral areas, the right and left, extend from the anterior axillary line in front to the anterior margin of the axillary scapula posteriorly. Above it is bounded by the axilla and below by the margin of the false ribs. A line drawn from the level of the superior border of the sixth rib to the inferior angle of the scapula divides this region into an axillary region above and the infraaxillary below. Within this region, behind the pectoralis muscles, may be felt the pulsations of the axillary artery, which here gives off branches supplying the structures forming the lateral wall, while the brachial plexus of nerves may be very markedly affected in this region. The drainage of the arm may be influenced by treating here the lymphatics of the axilla and the axillary vein. The branches of the intercostal nerves in this region are

particularly sensitive in case of any abnormality in the position of the ribs, and on the left side they will reflect any disturbance in function or structure of the heart; on either side, lungs and bronchi. The main bronchi are placed deeply within this area.

The infraaxillary regions contain beneath their surfaces lung tissue. In addition, the right one contains the right lobe of the liver. The left also contains the spleen and the fundus of the stomach.

Posterior region.

The posterior region of the chest extends from the first dorsal spine along the boundary of the supraspinous fossæ to acromion process, thence along the axillary margin of the scapula to the inferior angle, thence perpendicularly downward to the lower border of the twelfth rib, thence along the border of that rib to the twelfth spine. The same direction on the other side gives the completed boundary. A horizontal line through the inferior angle of the scapula divides it into a *subscapular* region below, further subdivided into a right and left, while the superior portion is again subdivided into a *suprascapular* region, lying above the scapular spine on either side corresponding to the suprascapular fossæ, a *scapular region* corresponding to the infraspinous fossæ, and a region lying between these, the *interspinous region*. The suprascapular regions cover the apices of the lungs, and contain

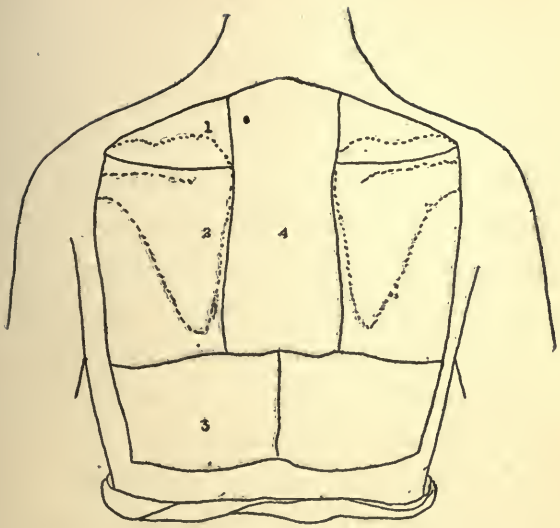


DIAGRAM SHOWING DORSAL THORACIC REGION AND ITS SUBDIVISIONS.

(1) Supra-Scapular.
(2) Scapular.
(3) Sub-Scapular.
(4) Inter Scapular.

supraspinati muscles covered by trapezii. The supra-scapular nerve passes in through the suprascapular notch and, passing downward under the acromion process, is distributed to the infraspinatus muscle. We here treat the deltoid muscle through its nerve, the circumflex, which is distributed to the skin over the shoulder joint, and to the teres minor and the deltoid. This nerve, a branch from the posterior cord of the brachial plexus, has its origin in fibres coming from

the fifth, sixth, seventh and eighth cervical, inclusive. Lying beneath this region is the substance of the lung.

Scapular region.

The *scapular area* reaches to the eighth rib and corresponds to the infraspinous fossa, though it extends more lateral than it. It is filled in by the trapezius and infraspinatus muscles, while the lower and lateral portion is crossed by the latissimus dorsi and teres major muscles. The relation of the latissimus dorsi to the scapula is an important one, serving to bind the scapula down at its inferior angle. Beneath the scapula lies the subscapularis muscle. It is worthy of note that the latissimus dorsi, the teres major and the subscapularis having related functions are supplied by the subscapular nerves, which, like the circumflex, take origin from the cervical nerves, the fifth, sixth, seventh and eighth. The deep contents of the scapular region are lung tissue. Its chief importance to the osteopath consists in its relation to the shoulder, and the further fact that the scapula offers a leverage on his patient.

The infrascapular regions contain lung and kidney on either side and on the right a large portion of the right lobe of the liver; on the left side, part of the spleen and the splenic flexure of the colon.

The right subscapular area should be examined most carefully, as in this region tenderness, either

superficial or intercostal, may manifest itself. This is the liver region, and tenderness over it or deeply beneath it means some disturbance in liver structure or function. At the spine are the centers for the liver, the kidney, the spleen and the small intestine. In fact, of so great importance is the spinal region of the cervix, thorax, abdomen and pelvis, bounded laterally by lines drawn through the tips of the transverse processes of the vertebra in the cervical region, the angles of the ribs in the dorsal, the transverse processes in the lumbar and the lateral margins of the sacrum and coccyx in the pelvic region, that this should be designated the spinal region.

Inter-scapular region.

In the *interscapular* region on either side lie the lung, bronchial glands, the main bronchus; while the left side contains in addition the aorta, œsophagus and thoracic duct. Within this interscapular region are the following centers: The lungs and bronchial tubes, the stomach, the liver, the upper part of the small intestine, and the augmentor fibres to the heart.

The muscles of the space are the trapezius, covering the whole area, the latissimus dorsi which covers the lower portion. Connecting the scapula with the spine are the rhomboidei major and minor and the levator anguli scapulæ and more deeply lying are the splenius capitis et colli and erector spinæ. In case of trouble

in any organ supplied by nerves from this region of the cord there will be tenderness on pressure applied to these muscles. This is the logical result of a contracture of muscles, and before the normal and natural impulses can pass along the efferent and afferent fibres all such contractures must be eliminated. Thus we work upon the muscles indicated. To do this most advantageously use the arm as a lever and by pressure on the muscles overcome their contraction. It is through muscles largely that we secure our ends, and by removing the inhibition or the irritation which results from their pressure upon the nerves the normal conditions are restored.

Examination of chest.

To examine the chest the patient should be stripped of clothing to the waist, except such as may be opened in front and raised behind, a loose waist or dressing sack. Avoid draughts and cold. The patient should stand or sit with body erect and arms hanging evenly at the side. Careful inspection, which is the first method of examination following the verbal, will reveal the general shape and symmetry of the chest, color, nutrition, size, the presence of tumors and abdominal bulging, or flattening of the chest wall.

The front of the chest should be first examined; for this purpose stand in front of the patient. Perfect symmetry is rare. Unusual development of the

muscles, unusual development of a viscus, occupation or spinal curvature are frequent causes of asymmetry. But marked malformations are not necessarily incompatible with healthy lungs and heart. The apex beat of the heart may or may not be seen. The undulatory movements of the chest should be the same on both sides, any marked variations either in rhythm or depth from the normal would suggest disease. Inspection should not reveal any difference between the right and the left sides. There may be coloring of the skin, either natural or acquired; if the latter it may be pigmentation, as in diseases of the sympathetic nervous system, or in hepatic disturbances. There may be unusual color due to vascularization, either a natural erythema, ruddy complexion, or the opposite. On the other hand there may be evidences of congestion, with eruptions as the result of arterial distension. From venous stasis may come ecchymosis and enlarged capillaries and superficial veins. Aside from this there may be either cyanosis, anæmia, pallor or general congestion.

Detect any local bulging due to tumors or abscesses within the chest wall or to deformities of the bony structure. There may be asymmetry due to pressure from within, as hypertrophy of the heart, or the accumulation of gases or fluids within the pericardium, or

hydro- or pneumo-pericardium. The lungs may exert a pressure on the chest wall in tumors and swellings, and in pleuritic accumulations of gas or fluids. Even the thoracic form may be modified by the enlargement of abdominal organs due to fibroid growth, or to the accumulation of gases or fluids.

Enlargement.

In the pigeon breast from rachitis there is marked projection of the lower end of the sternum and a straightening of the ribs with a lessening of the transverse diameter.

The alar or flat chest is accompanied by a narrow chest, acute costal angle, a flattening in the region of the dorsal spinal curve, winglike projecting scapulæ, drooping shoulders, and neck set forward. These conditions are accompanied by weakness of constitution, and indicate imperfect expansion of the lungs, poor heart action and inability to resist disease. Such a patient is particularly liable to pulmonary tuberculosis.

The lateral areas should be examined for tumors, pleuritic bulgings, etc. The posterior region should be carefully inspected for abnormalities, curvatures, straightening of spine, contractures of muscles, displacements, etc.

Osteopathic palpation.

The osteopath uses inspection just as the medical practitioner, and reasons from cause to effect through anatomical connections. When the osteopath palpates

he uses the name and changes the deed both in method and motive. Palpation to the old school meant the laying on of hands and trying to gain a knowledge of the internal condition by the sonant vibrations from the vocal chambers and from the transmitted movement of the apex of the heart. The osteopath uses his finger tips. With these he carefully explores the region of the spine determining if the spinous processes are prominent or retreating. He determines any deviation from the perpendicular line. His fingers tell him if the spines be separated, representing a point of weakness or a break. His trained fingers carefully examine the articulation of the tubercle of the rib with the transverse process and note any congestion, slip or thickening of the tissue here.

Tenderness in any of these locations is the sign of a lesion, of the organs governed by that centre. This requires a careful differential diagnosis. Should there be a distinct anatomical disarrangement then a correction of this condition will almost certainly remove the disturbance. Should it be a transferred or sympathetic tenderness, then the effect of treatment here may be transient or permanent. Even in acute cases, expect osseous lesion, there is always tenderness.

Sounds of the heart.

To examine the heart there must be first an ability to distinguish the normal sounds and the locations

at which they are best heard. This can be determined by means of the ear unaided, but the stethoscope or phonendoscope will aid in localizing and in analyzing the sound. The points at which you would apply the ear are as follows :

For the aortic sound at the union of the second rib and its cartilage on the right side. For the pulmonary sound the corresponding position on the left side. The mitral is most advantageously heard at the point of the cardiac impulse in the fifth interspace. This sound is also heard in abnormal conditions between the vertebral margin of the scapula and the spine at the level of the fifth or sixth rib. This has the advantage of being entirely removed from the other heart sounds. It is important to remember that the mitral valve is affected more frequently than any other valve of the heart. Investigation of the tricuspid is best conducted at a point just below the end of the sternum in the soft wall, or else at the cartilages of the false ribs on the right side.

The theory upon which the osteopath works in treatment of cardiac troubles is this :

Theory of cardiac treatment.

First. He affects the amount of work that the heart is doing through vaso-motors, increasing or decreasing it at will through peripheral resistance.

Second. Through augmentor fibres he increases or decreases the intensity of the impulses and thus directly affects the heart.

Third. Through the inhibitory effect of the vagus he quiets an excited heart.

Fourth. Through the general systemic effect of the vaso-motors and the cardiac augmentors he contributes to the general nutrition of the heart.

Fifth. The motor nerves to the papillary muscles are from the upper dorsal, and by these any valvular weakness of an atonic nature may be removed.

Sixth. The sensory fibres to the heart are from the upper dorsal region. Removal of any irritation to these will quiet any excited condition of the heart.

Treatment is directed to all these sources. Tenderness is usually marked at the angle of the fifth rib on the left side, also at the chondral articulation of this rib. Pressure at these two points at the same instant will produce a sensation as of some sharp instrument passing through the thorax. Examination of the ribs will show them to be rotated downward, bringing the inferior margin almost in contact with the superior margin of the rib next below. This results in tenderness of the intercostal nerves. The treatment which the osteopath administers depends upon the nature of the case. Any contracture of the

rhomboids, or the more deeply lying splenius, semispinalis, multifidus spinæ, transversalis colli, etc., must be removed, and in case of nervous affection this treatment, together with building up the nutrition of the body through the digestive organs, will prove sufficient. By elevating the ribs the capacity of the chest is increased, thus removing the pressure upon the pericardium. This frequently is done in cases in which the patient complains of a feeling of smothering and compression of the heart.

Relaxing the muscles of the neck and pressure upon the middle and inferior cervical ganglia will reduce the rapidity of the heart-beat.

Steady pressure on the solar plexus will quiet an over-exciting heart.

Heart lesions and treatment.

In chronic heart trouble you will find costal or vertebral lesions. Examine carefully the vertebra from the second to the fifth dorsal. To treat, relax by pressure the interscapular region, place patient on right side and pull upward and forward, pressing with right hand against angle of ribs. Another movement is to place patient on face and put sudden pressure on ribs at tubercle or transverse process. Have patient, sitting, lock his hands behind occiput. Standing at his back the operator passes his hands under patients arms and clasps them across back of

neck. Pulling downward on each side alternately will aid in overcoming an anterior condition.

EXAMINATION OF THE LUNGS.

To understand the location of the lungs it is necessary to be thoroughly conversant with the landmarks of the chest and with the location of certain lines. A perceptible ridge at the junction of the manubrium with the gladiolus, marks the level of the second cartilage. The nipple is between the fourth and fifth ribs just external to their cartilages. The lower border of the pectoralis major corresponds with the fifth rib. The scapula covers the ribs from the second to the seventh. The end of the sternum is at the level of the tenth dorsal vertebra. The following lines are useful:

Thoracic lines.

The mesosternal, the middle line of the chest anteriorly.

The sternal, following the margin of the sternum.

The mammillary, parallel to the mesosternal, through the nipple.

The parasternal, midway between the mammillary and sternal.

The anterior axillary, a perpendicular line dropped from a point at which the pectoralis major leaves the thorax, the arm extended.

The posterior axillary, a vertical line at the point where the latissimus dorsi leaves the chest, arm extended.

The midaxillary line, midway between the anterior and the posterior axillary.

The scapular line, vertical from the inferior angle of the scapula.

Right lung.

The right lung extends about one and one-half inches above the first rib into the suprascapular region. It follows downward, reaching the mesosternal line at the second costal cartilage, following it to the sixth, thence it turns outward following the sixth rib to the mammillary line. It is at the eighth rib in the midaxillary line and at the tenth rib in the scapular line. This lung has three lobes formed by the two fissures, long and short. The long fissure extends from above and behind obliquely downward and forward. It begins near the third dorsal vertebra and passes to the midaxillary line at the fourth rib and cuts the mammillary line at the sixth. The short fissure begins near the anterior border of the scapula at the level of the third rib where it unites with the long, passes downward, inward and forward to the junction of the fourth costal cartilage with the sternum. Above this lies the upper lobe of the lung.

Between the third and the lower margin of the sixth rib is the middle lobe. The lower lobe is posterior to and below the long fissure. It reaches the thoracic wall in the lateral and subscapular region, but is absent in front.

Left lung.

The left lung extends one inch higher into the neck than the right. It leaves the mesosternal line at the fourth costal cartilage, passes obliquely downward to the sixth rib in the mammillary line and between the eighth and ninth ribs at the midaxillary, and between the tenth and eleventh ribs in the scapular line. It has but one fissure which divides it into the upper and lower lobes.

This fissure begins near the third vertebra, extends downward, forward and outward to the midaxillary line where it is at the level of the fourth rib. In the mammillary line it cuts the lower margin of the lung at the sixth rib. The upper lobe anteriorly occupies all above the sixth rib; laterally, above the fourth rib, and posteriorly above the spine of the scapula. The lower lobe is absent anteriorly and lies below the upper lobe, posteriorly and laterally.

In examination and treatment of the lungs it is necessary to keep their outlines in mind. Their space is easily encroached upon by any abnormality in the shape of the thoracic wall.

The pleura and lungs are supplied with sensory fibres from the spinal nerves coming from the first to the seventh, though Quain limits it to the upper five. The lungs are supplied by viscero-motor fibres from the vagus and by vaso-motor fibres from the upper dorsal, though some observers find these also to come from the vagus. But in either case they make their exit from the upper dorsal nerves.

Treatment of lungs.

Our treatment for pulmonary or bronchial trouble is as follows: Contractures, in the upper spinal regions, are reduced, the ribs are elevated by pressing against their tubercles and pulling the arm upward and backward. The patient lying on his back the hands are drawn up over the head, the patient inhaling deeply, then are pushed downward as he exhales. Another treatment is to place the patient on a stool; placing your knee between his shoulders grasp the arms near the elbows, pull upward and slightly backward, the patient breathing as before.

In bronchial troubles pay particular attention to the anterior portion of the chest, placing two fingers between the ribs parallel to them, then turn and press upward and outward at the same time. This relaxes the intercostal muscles and removes irritation to the sensory nerves.

CHAPTER VIII.

ABDOMEN AND PELVIS.

AS THE divisions of the abdomen with their contents may be found in all works on anatomy it will be omitted here.

The linea alba, or central abdominal line, extends from the ensiform cartilage to the symphysis pubis.

The rectus muscle is crossed by three tendinous intersections which divide it into three portions. These sometimes cause mistakes in diagnosis, as a spasmodic contraction of one of these, or a collection of fluid within the sheath is taken for disease of the abdominal organs. The lowest is at the level of the umbilicus, the next at the level of the lower portion of the tenth rib and the highest at the ensiform cartilage.

The umbilicus is the most prominent landmark of the abdomen, lying in the middle line, nearer to the pubes than to the ensiform. It is usually at the level f the disc above the third lumbar vertebra.

About one and one-half inches below the umbilicus at the level of the highest part of the iliac crest is the bifurcation of the aorta into the two common iliac. Here is the hypogastric plexus.

Femoral dislocations.

The anterior superior spine of the iliac is of great importance to the osteopath since it is taken as a fixed point in determining the length of the limb or nature of pelvic or hip troubles. This point is of importance in diagnosing femoral dislocations. The thumbs placed on either spine and the fingers grasping the trochanters will easily enable you to appreciate any difference in the relation of the two sides.

The pubic spine is of importance in deciding the nature of hernia; the spine is on the outer side of an inguinal hernia; on the inner side of a femoral.

Lying one or one and one-quarter inches external to the spine of the pubes on the line connecting it with the trochanter major is the femoral ring which is the upper end of the femoral canal. On account of the relation of the internal saphenous vein and the femoral artery and vein this canal is of much importance.

Just above and slightly external to the spine of the pubes is the external abdominal ring. The inguinal canal, of which the external abdominal ring is the inferior opening, extends obliquely downward and

inward almost two inches from the internal abdominal ring, about midway between the anterior superior iliac spine and the symphysis, more than half an inch above Poupart's ligament. The external ring transmits the round ligament in the female and the spermatic cord in the male, two very important structures in osteopathic practice. It is well to emphasize a caution before given, that the operator be careful to use the finger tips carefully to avoid injury or irritation. *External abdominal ring.*

Lying chiefly within the hypochondrium, sheltered by the ribs and cartilages is the liver — the largest gland in the body. It extends above the colon, stomach and duodenum, from the right hypochondrium across the epigastric region into the left hypochondrium, as far as the mammillary line.

The liver is from six to eight inches long, weighing not far from five pounds, varying with the individual, and in the same individual at different times. Its relation to the digestive and circulatory systems is a peculiar one. It receives an abundant blood supply and performs important changes on the partly assimilated food stuffs. Its highest point is on the right side, extending upward to within an inch of the nipple, or on the right side at the mammillary line it arises to the upper border of the fifth interspace. *The liver.*

The liver on the right side is covered by the ribs from the sixth to the eleventh inclusive. On the left it lies beneath the cartilages of the sixth and seventh ribs, its lower margin across the epigastrium lying across the stomach corresponding to a line drawn from the end of the ninth rib on the right to the junction of the seventh on the left. At the point where the liver crosses linea alba, half way from the ensiform to the umbilicus, the edge is easily felt.

Constriction of the thorax and abdomen by stays may result in displacement of the liver downward. Here the liver lies in direct contact with the abdominal wall. In precussion for liver dullness it must be remembered that superiorly it is covered by lung, that the phrenic sinus due to the arching upward of the diaphragm is next, while the region of absolute liver dullness is below the diaphragm. In the gastric fossa sometimes loops of distended intestine lie anterior to it, resulting in a tympanitic note. Its nutrient blood is from the hepatic artery, a branch of the cœliac axis, while its functional blood, much increased during digestion, comes from the mesenteric veins, the gastric and the splenic.

Functions of liver.

Its secretion is double, an internal contribution to the blood, glycogen and urea; an external, from the gall cyst or directly from the liver into the digestive

tract. Bile is a utilized waste product, as by its presence in the intestines it increases functional activity of the tract and aids in absorption of fats. The urea which it throws into the blood stream is an end product of nitrogenous katabolism. Glycogen is a carbohydrate which is essential as a force former; the pigments and acids of the bile when not thrown into the sewage of the body act as harmful substances within the blood, affecting the nerve centers, thus retarding metabolism. Any impairment of the functions of the liver will result in the retention within the blood of the antecedent substances from which the urea is formed. This substance, carbonate of ammonia, acts as a powerful poison to the nervous system; hence the nervous disturbances that usually attend hepatic lesions.

Its nerve supply is from several sources; the left pneumogastric contributing fibres directly to the liver from its distribution over the lesser curvature of the stomach. The solar plexus through the cœliac plexus sends fibres along the hepatic artery. These fibres are from three sources, the right pneumogastric, the splanchnics and the phrenics. The phrenics are distributed to the capsule and to the superior portion of the liver. The splanchnics are the vaso-constrictors. The vagi furnish vaso-dilator fibres and most likely

secretory fibres, though the existence of the latter has never been definitely proven.

Where treated. The center for the liver is rather a diffuse one, though it is definitely located between the ninth and tenth on the right side. The connection with this segment is to be found in the splanchnics. Again, the liver may be reached through the solar plexus directly, or along the course of the hepatic artery. This may be reached one and one-half inches above the umbilicus and about the same distance to the right of the middle line. Always examine the seventh to the tenth ribs inclusive as they may by pressure cause trouble with this organ.

The gall bladder is normally covered by liver substance lying inferior to the fossa vesicalic at the margin of the quadrate lobe, the fundus alone extending from beneath its glandular covering, emerging from its chondral protection just at the level of the ninth cartilage. Under normal conditions the gall bladder cannot be felt, though it may be if distended. It is just external to the right rectus muscle.

Since all the blood passing through the cœliac axis and some from the inferior mesenteric artery passes through the portal system, it is clearly seen that the liver is influenced by the condition of the circulation, and also that any failure of the liver to function would

result in leaving in the blood substances whose effects are those of poisons.

Our treatment of the liver which has for its object the restoration of function through its nerve and blood supply is as follows:

First. Treatment to relieve any congestion or subluxation in the liver area, the ninth and tenth dorsal.

Second. Local effects through the solar plexus or branches from it.

Third. A stimulation of the pneumogastric.

Fourth. By vibrating the thoracic walls over the liver with the heel of the hand, thus physically causing a change in its circulation and supplying its cells with pure blood.

For sluggishness of the liver resulting in torpidity of bowel, the gall cyst is induced to empty its contents into the duodenum by pressure on the fundus. To accomplish this the hand is placed on the abdominal wall at the ninth rib, just external to the rectus. The legs are flexed upon the abdomen, the patient lying either on the back or on the left side. The patient is instructed to take a deep inspiration and then as the breath is sent out the hand follows the retreating wall and pressure is thus put on the fundus. This is not a mechanical emptying but a stimulus applied directly to the fundus, resulting in a peristalsis.

Failure of the liver to function may cause icterus, nervousness, skin eruptions, sleeplessness, drowsiness, constipation, hæmorrhoids, etc.

Spleen.

The *spleen* is a much less important organ than the liver, both in size and in function. It lies, as we said, at the level of the tenth rib. Its upper margin is on a level with the ninth dorsal spine, its lower with the eleventh. It lies in the infraäxillary space, extending from the anterior axillary line to the posterior. Covered with the chest wall, it cannot be felt, save in case of enlargement. For examination the operator must rely on percussion, save in enlargement. In all infectious and malarial diseases the spleen is affected and should have proper care. The general circulation must be maintained. The ninth and tenth dorsal on the left side will reach the spleen through the sympathetic. The right vagus also contributes to this organ.

Stomach.

The *stomach* lies in the upper abdominal region extending from the left hypochondrium across the epigastrium to the edge of the right hypochondrium. This places about one-sixth to the right of the median line, five-sixths to the left. The cardiac opening lies just to the left of the middle line opposite the seventh chondro-sternal articulation. The fundus extends up

as high as the sixth interspace and emerges from the hypochondrium at the end of the ninth rib.

In the median line in moderate distention the lower edge of the stomach extends about an inch lower than the liver, one and one-half inches above the umbilicus. Arching upward and to the right the pylorus is situated beneath and behind the liver opposite the first lumbar vertebra and back of the end of the eighth rib. Under normal conditions the pylorus cannot be felt.

The fundus lies in the left hypochondrium and extends to the cupola of the diaphragm. Distention may seriously encroach upon the thoracic space, leading to palpitation and irregularity of heart action, and shortness of breath. This must be examined in functional disturbances of the heart.

The stomach is covered anteriorly by the diaphragm and the thoracic wall formed by portions of the sixth, seventh, eighth and ninth ribs, the left and quadrate lobes of the liver and the abdominal wall. It lies anterior to the abdominal aorta and vena cava and the cœliac axis. It is in relation with the left kidney, the spleen and its vessels, the pancreas, the colon and part of the duodenum. Back of the stomach lies the solar plexus which, to the osteopath, is its most important relation.

Blood and nerve supply.

The stomach has a liberal blood supply; from the cœliac axis, the gastric; from the hepatic, the pyloric; from the gastro-duodenalis, branch of the hepatic, the gastro-epiploica dextra; from the splenic, the vasa brevia and the gastro-epiploica sinistra. Thus the entire blood supply is from the cœliac axis through its subdivisions and their branches.

With the blood vessels the stomach receives innervation from the solar plexus, fibres coming from the splanchnic and from the right pneumogastric. In addition the stomach receives fibres directly from both the right and left vagi. These fibres from the vagi enter into the structure of the walls of the stomach and are supposed to end within the fibres of the muscles. Experiments upon animals show the vagi to be the nerves of motion to the stomach, stimulation of its peripheral portion after section resulting in increased movement. But the fact of section of both vagi does not mean a cessation of motion, for the stomach will manifest normal movements after all nervous connections have been severed. It may be that the stomach has the power of originating motion, — a property derived perhaps from the plexuses of Auerbach within the walls. The solar plexus contributes chiefly vaso-constrictors from the splanchnics, though vaso-dilators also are found. The splanchnics entering

into the cœliac plexus also carry secretory, inhibitory, and sensory fibres. These splanchnic fibres are from the fourth to the eighth dorsal in orgin, though we get our surest effect at the fourth to sixth dorsal vertebra, more accurately between the fourth and fifth.

Position of Duodenum.

The *duodenum* begins at the level of the first lumbar vertebra on the right side, lying beneath the cartilages of the false ribs at the level of the sixth interspace. It curves upward, backward and to the right. It is in close relation with the liver and gall cyst superiorly. Above and posterior to it run the hepatic artery, portal vein and bile duct. It now descends over the vena cava ascendens and the right kidney to the level of the fourth lumbar vertebra. It here ascends obliquely upward across the third and fourth lumbar vertebræ, crossing the vena cava and aorta to its ascending portion lying beside the aorta and the fourth, third and second lumbar vertebræ. The head of the pancreas lies within the concavity of the arch, while the body lies above the transverse and ascending portions. The terminal portion of the duodenum lies behind the stomach to the left of the superior mesenteric vessels, and just at the inner side of the left kidney. This now marks the beginning of the second portion of the small intestine, the jejunum, which continues for the next two-fifths of the length of the

small intestine, the remaining portion being called the ileum.

The small intestine as a whole lies within the middle zone of the abdomen, the mesogastric, practically filling the umbilical region, lying anterior to the ascending colon in the right lumbar and bearing the same relation in the left lumbar to the descending. The small intestine will or will not lie in the pubic region according as the bladder is empty or distended.

Location and Treatment of Mesentery.

The mesentery, to which so much of the blood of the mesenteric artery is sent, lies almost exclusively in the umbilical region. Gentle movement and pressure here will quiet pain in the small intestine.

In the right iliac region lies the cæcum and the point of union of the cæcum and the ileum. Beginning at this point is the large intestine, the ascending portion passing up through the right lumbar to the inferior surface of the liver, thence across the abdomen on a line separating the umbilical and epigastric regions, as the transverse colon. It lies above the umbilicus in this region and in front of the duodenum next to the anterior abdominal wall. The descending colon extends from the splenic flexure in the left hypochondrium downward for eight inches to the iliac crest, at which point begins the sigmoid or omega loop.

The *kidneys* lie on either side of the vertebral column, anterior to the transverse processes, extending from the upper margin of the twelfth dorsal vertebra to the upper part of the third lumbar. Covered laterally by the twelfth rib and by the quadratus lumborum and psoas muscles, palpation will reveal but little as to their condition. Tenderness, muscular contraction, vertebral and costal dislocations are the leading symptoms to the osteopath. Urinary examination must also be made.

Above the kidney on the left side is the spleen, on the right the liver. The nerves to the kidney come through the solar plexus and chiefly from the least splanchnic nerve. Some fibres are derived from the aortic plexus. Vaso-constrictor and sensory fibres to the kidney are from the eleventh dorsal to the first lumbar inclusive.

Treatment of Kidneys.

To treat the kidneys the patient is placed on side, facing operator, the knees and thighs are flexed and strong pressure is applied to the lower dorsal and upper lumbar regions, the spine being strongly moved backward and forward at the same time.

Another treatment is strong and steady pressure at this point, the patient lying on his face.

Again, the patient lies on his back with legs drawn up. The operator puts hands beneath him, palms

upward. Now, with the patient lying on finger tips, the operator repeatedly raises him, relaxing the muscles, at the same time rotating the legs and moving them from side to side.

The massive bony basin which lies beneath the abdomen has for its structure four bones compactly put together, the sacrum, the ilium, the ischium and the pubes. This constitutes the *pelvis*.

The Pelvis.

The plane passing through the upper margin of the symphysis, linea ilio-pectinea and the sacral prominence divides this basin into two portions; the part above, the false pelvis, and the part below, the true pelvis. The false pelvis is in position and function a portion of the abdominal cavity, serving to hold the weight of the intestines from the pelvic organs. The anterior boundary is between the widely separated iliac spines closed by abdominal parieties.

This region, which is really a portion of the hypogastrium, is bounded laterally by the ossa ilii and contains part of the intestine; the bladder in distention, and the uterus in pregnancy, extend up into this region.

External Abdominal Ring.

Opening through the abdominal or pelvic wall, just above and to the outer side of the crest of the os pubis, is a hiatus in the external oblique muscle called the external abdominal ring. This opening lies above

and internal to Poupart's ligament at its insertion into the pubic spine, extending about an inch upward and outward from a point between the spine and symphysis. This opening transmits the spermatic cord or the round ligament, according to sex.

The points of importance to the osteopath are these: An inch lateral to the lumbo-sacral articulation just above, and median to the posterior superior spine is the posterior sacro-iliac ligament. The lumbo-sacral articulation is itself one of the weak portions of the spine. Here, in case of slip, strain or dislocation, will be found marked tenderness. One and one-half inches below and three-fourths of an inch lateral to this point is the lower and posterior portion of auricular articulation, below the posterior superior spine. Tenderness here is indicative of a slip of the ilium upon the sacrum. An inch below this is the great sacro-sciatic notch, lying under the posterior inferior spine of the ilium. About two inches below the inferior iliac spine is the ischiatic spine, which with the lesser sciatic ligament attached to it converts the greater sciatic notch into a foramen and separates it from the lesser notch below.

Pyriformis Muscle.

The pyriformis muscle passes through the greater notch and attaches to the great trochanter. This is a very important structure. Above this muscle pass

out the gluteal artery and vein and the superior gluteal nerve; through this notch, below the muscle, pass the two sciatic nerves, the sciatic vessels, the internal pudic vessels and the pudic nerve. The pudic nerve passes over the spine and re-enters the pelvis through the lesser notch. This nerve is distributed to the penis or clitoris, to the rectum and to the perinæum.

The pyriformis, the gemelli, the obturator and the quadratus femoris muscles may all be relaxed by internal rotation of the thigh, accompanied by pressure. This will be useful in rheumatism of the muscles of the hip, in sciatica and in vaso-motor or circulatory disturbances in the limb.

The ischiatic tuberosity is to the side of the anal opening and can be plainly felt. Half way between this point and the trochanter major the great sciatic nerve may be compressed.

The coccyx can always be felt just above the anus. It is important that it be in correct position as it is frequently the cause of constipation, coccygodynia, etc. It can be best examined per rectum.

The anterior bony prominence is the pubic spine nearly an inch lateral to the symphysis. It should not be sensitive to pressure, but if there be a slip of the ilium on the sacrum there will be marked tenderness

at symphysis. Also one side will be elevated or depressed as the case may be.

Ischio-rectal fossa.

The ischio-rectal fossa lies between the anus and the tuberosity of the ischium. In this the osteopath reaches the levator ani, sphincter ani, the coccygeus muscles, fascia covering important structures, the walls of the rectum, the posterior wall of the vagina, the pudic nerve and vessels and their branches.

The ischio-rectal fossa is also treated by insertion of the finger into the rectum. Here, too, may be treated the prostate gland and the membranous urethra. The lower and upper sphincters may be reached and dilated and a stimulation applied to the rectal wall. Treatment per rectum should not be given more often than once per week, except in rare cases. Rectal examination will reveal much as to the position of the uterus. Vaginal examination will detect the urethra along its anterior wall, the rami of the pubes and ischia. The ovary cannot be felt either per vagina or through the pubic region unless prolapsed or enlarged. They lie two inches on either side of the middle line of the body and about the same distance above the pubic crest.

CHAPTER IX.

THE LIMBS.

THE shoulder is to the osteopath an important articulation. The arm is used in many of the movements which the operator administers. Owing to the multiform uses of the arm and hand, the shoulder is called into actions varied and constant, so that strains and dislocations are of frequent occurrence, while the massive musculature is prone to deposit the product of destructive metabolism within the tissues which go to perfect its motion. From strains, colds and rheumatism, the shoulder suffers more often than any other joint.

Landmarks of shoulder.

The *clavicle* extends in an almost horizontal position from the manubrium sterni to the acromion process where usually the acromio-clavicular joint forms an almost even plane, but there may be a noticeable enlargement of the acromial end of the clavicle or an increase of the fibro-cartilage in the joint. This

prominence is often mistaken for a dislocation or for a clavicular fracture. On the other hand a dislocation is often mistaken for this projection. When in doubt compare carefully with other shoulder. The three chief landmarks are, (1) the union of the scapular spine with the acromion process, a fixed point from which to measure the relative lengths of the arms ; (2) the coracoid process about two inches anterior to this, and (3) the greater and lesser tuberosities of the humerus.

The greater tuberosity faces in the direction of the external condyle ; the lesser in the normal position of the arm lying somewhat in front and toward the median line of the body. The bicipital grove may be felt on deep pressure lying between the tuberosities, extending downward marking the direction of the biceps muscle. The head of the humerus can be felt above the axillary space. If low in the axillary space, or below and in front of the coracoid process, or behind on the back of the scapula below the acromion, it is dislocated. Great care must be used in diagnosing a dislocation as sometimes a fracture may be overlooked. Crepitation, freedom of movement and holding the head of the humerus while the arm is moved will aid in differentiating between these conditions.

The clavicle is attached to both the sternum and the cartilage of the first rib by ligaments which allow of motion, though limited, in all directions, and is the center of all movements of the shoulder. It passes high above and internal and posterior to the coracoid process, to which it is bound by the coraco-clavicular ligament. The clavicle is firmly bound to the acromion, yet in such a way as to permit either bone to move on the other, the clavicle gliding, the scapula rotating on the clavicle. This articulation sometimes becomes the seat of acute pains which manifest themselves in elevation of the shoulder. This joint is supplied by the suprascapular nerve. The nerves to the shoulder joint are the suprascapular and the circumflex, from the brachial plexus.

Muscles of shoulder.

The muscles which connect the arm with the trunk, with which the osteopath is most especially concerned, are the following: The pectorales major and minor and the subclavius which are useful in ordinary movements of the arm and shoulder, yet their use is much magnified by the osteopathic practitioner. These three muscles all attach to the ribs, the subclavius to the first, the pectoralis minor to the third, fourth and fifth, while the major embraces the clavicle, sternum and cartilages of the ribs to the seventh, thus giving the ideal leverage on the ribs for

drawing them up and expanding the chest. In case any of the first six or seven ribs are deflected these muscles are used in replacing them, by drawing the arm upward, outward and backward, pressing at the same time on the angle of the ribs. The nerves of the pectoral muscles pass inward, the external crossing the axillary artery, the internal lying between it and the vein and both passing across the pectoralis minor; the external piercing the costo-coracoid membrane, thence between the muscles and thus lying by its branches both below and above the pectoralis minor.

The blood supply to the pectoral region is from the superior thoracic, thoracic branch of the acromial thoracic and the long thoracic together with the subscapular. These are all branches from the axillary artery and may be reached in the axillary space beneath the pectoralis muscle.

Costo-coracoid membrane.

The costo-coracoid membrane covers the space between the clavicle above, the pectoralis minor below, the coracoid process externally and the first rib internally; these points being its attachments. The anterior thoracic nerves may both be reached here as may the acromial thoracic, the superior thoracic vessels and the cephalic vein. The last is useful in drainage of the arm.

The deltoid muscle raises the arm at right angles laterally to the trunk and together with the teres minor receives the circumflex nerve. The teres minor can be reached in the posterior scapular region, extending from the scapula to the lowest facet of the humerus. This muscle rotates the humerus outward and with the major and the supraspinatus protects the joint from anterior dislocation.

The deltoid muscle.

The circumflex nerve which supplies the deltoid and the teres minor is distributed to the joint and to the skin covering it. It crosses the quadrilateral space formed by the long head of the triceps internally, the neck of the humerus externally, the teres minor above and the major below. Here it may be reached either anteriorly or posteriorly. The branches are upper and lower, the lower may be reached at the posterior margin of the deltoid, the upper at the anterior. This nerve is frequently involved in case of trouble at the shoulder.

The two spinati muscles which insert into the upper and middle facets of the humeral head, act with the deltoid and the teres minor. The supraspinatus in elevating the arm, the infraspinatus in rotating the humerus outward. The suprascapular nerve coming from the fifth and sixth cervical supply those muscles, while it also distributes branches to the shoulder and

to the claviculo-acromial articulation. This nerve enters the supraspinatus fossa at the suprascapular notch and crossing the fossa passes beneath the acromial end of the spine to the infraspinatus muscle. It may be reached either at its origin or as it crosses the fossa beneath the trapezius and the supraspinatus muscles.

The subscapularis muscle passes from the ventral surface of the scapula and serves as a guard against anterior dislocation of the humerus by inserting into the lesser tuberosity. Its nerve supply is in common with the teres major and the latissimus dorsi, derived from the subscapular nerves. These nerves come from the fifth to the eight cervical and may be reached at their origin or at the posterior border of the axilla.

Leverage.

By means of the arm and shoulder the osteopath obtains leverage upon the entire vertebral column. Through the latissimus dorsi on the lower dorsal and lumbar, through the teres and subscapularies by the rhomboids he puts stress upon the upper dorsal. The levator anguli scapula connects the shoulder with the cervical region.

The rhomboids are innervated from the fourth and fifth, or from the trunk of the fifth just before the cord is formed; the levator anguli scapulæ gets the third cervical.

The important muscles of the shoulder joint are the biceps, coraco-brachialis and triceps. The inner margin of the coraco-brachialis lying almost parallel with the axillary artery. The long head of the biceps lies in the bicipital groove, is attached to the supra-glenoid tubercle and is thus closely related to the joint, being easily involved in troubles of the shoulder. Its location may be determined by the two tuberosities between which it lies. The median nerve and the brachial artery lie along the inner margin of the coraco-brachialis and the biceps, the median lying first external and then crossing the artery in its middle course. The ulnar nerve lies about an inch internal to the median, almost parallel to it, leaving it at the elbow; the median at first passing beneath the bicipital fascia to the middle of the forearm. The basilic vein lies between the artery and the ulnar nerve, a fact to be remembered as this vein is useful in drainage.

Landmarks of elbow.

The *elbow* is the seat of much trouble, lack of motion, displacement, etc. The outer and inner condyles are easily located, while the olecranon process of the ulna comes on a level with those two points when the arm is extended. Place the thumb on one condyle, the middle finger on the other and the index finger on the olecranon. Ulnar dislocation would destroy these relations. The olecranon is nearer the inner than the

outer condyle. Between the olecranon and the inner condyle is a depression which conveys the ulnar nerve —the funny bone of the laity. External to the olecranon is a well marked depression lying just below the external condyle. This is one of the most important landmarks, since deep within it, external to the supinator longus and the extensor carpi radialis may be felt the head of the radius moving in pronation and supination. This is a guide in determining dislocation of the radius. The lymphatics of the elbow usually are the first to manifest excitation if poisons are absorbed through wounds of the hand,—a small gland just above the internal condyle usually first showing this condition. The musculo-spiral nerve winds around the arm and becomes anterior above the external condyle.

The simplicity of structure of the arm makes this a very easily studied articulation. The biceps, the brachialis anticus and the supinator longus are the chief muscles of flexion of the forearm. The triceps is the chief extensor, the anconeus which may be considered as a portion of the triceps, assisting. The two supinators are innervated by or from the musculo-spiral, the pronators by the musculo-cutaneous.

The usual dislocation at the elbow is one or both bones backward or else both forward ; the former when

the forearm is extended, the latter when flexed. Lateral displacement is rare. The usual method of reducing such dislocation is by a direct pull, the knee may be placed at the bend of the elbow, and straightening the arm, at the same time exercising great force so as to overcome the dislocation.

The wrist. The wrist is frequently the seat of synovitis arising from rheumatic troubles or from pyæmia. Distention of the synovial sack causes fullness over the back of the wrist. The styloid processes are the guides to the wrist, that of the radius extending downward farther than the ulna. There is a bony furrow on the back part of the radius which transmits the tendon of the extensor longus pollicis muscle. This is the place of examination in case of Colles fracture of the radius. In case of radial fracture the styloid process of the radius will be on a level with or above the styloid of the ulna. The scaphoid tubercle may be distinguished just below the radius, the articulation of these bones lying between these points. The trapezium lies just below and articulates with the metacarpal of the thumb. The pisiform bone may be felt just below the ulnar styloid, the unciform lying within. The tendons of the wrist are important. The extensors may be traced, using each alternately, the three extensors of the thumb lying on the outer side of the wrist. The

flexor carpi radialis tendon is a guide to the radial artery.

The *hip* is related to many important structures which bear upon the physiology of the limb. You will recall some points referred to in the preceding chapter, namely, the symphysis pubes and the spine of the pubes which lies external to the symphysis on the same level as the upper part of the trochanter major. About one and one-half inches external to this is the saphenous opening, a point at which a femoral hernia first makes its appearance. The point is just below Poupart's ligament. Its chief importance to the osteopath lies in its relation to the drainage of the leg. The femoral ring is half an inch higher than the saphenous opening. Find the pulsation of the iliac artery, pass toward the median line one-half inch from the iliac vein and next is the femoral opening or ring. The anterior superior spine of the ilium is another point of interest as being the fixed point of measurement in case of suspected dislocation.

Saphenous Opening.

The trochanter major is a prominence which cannot be missed. It is covered by the skin and by the fascia of the gluteus maximus. The head of the femuris about three-fourths of an inch above the level of the pubic spine, in all positions looking in the direction of the inner condyle. Great care is necessary in diag-

nosis of femoral dislocations. The osteopath must bear in mind the fact that even partial or complete dislocation may be the result of tubercular processes. *Motion in such cases is a positive injury*, though treatment may be effective if directed toward the blood and nerve supply. In dislocation the ilio-femoral ligament, the most resistant portion of the capsular, determines largely the position of the hip.

Test for dislocated hip.

To detect dislocation the patient should be lying straight, face upward; place the thumbs on the anterior superior spines of the ilia. A comparison of the two sides is usually the surest way of determining relative positions of the parts. Nelaton's line is useful. It is a line from the anterior superior spine to the tuberosity ischii. On this line lies the center of the acetabulum and at the same level as the trochanter major. The femur may be dislocated in any direction; backward, either above the dorsum ilii, or below the obturator internus muscle into the sacro-sciatic notch, or it may be anterior on the pubes or inferior into the obturator or thyroid foramen.

The chief muscles which serve as landmarks around the hip are the glutei, the sartorius and the adductor longus. Raising the leg will throw the sartorius and adductor longus into relief, thus outlining Scarpa's triangle.

Between the ischiatic tuberosity and the greater trochanter may be reached the sciatic nerve, lying close to the femur. It may be followed down the thigh, where it divides into popliteal branches above the popliteal space. This nerve supplies the hamstring muscles, the adductor magnus and some branches to the hip joint, while some fibres from both its popliteal branches are distributed to the knee.

Obturator nerve.

The obturator nerve may be reached just below the pyriformis internal to the sciatic. This nerve supplies the acetabulum and also the teres ligament and in common with the sciatic and the anterior crural nerve is distributed to the knee on its inner side. It is one of the three nerves affected when trouble at the hip is indicated by pain at the knee. The adductors and gracilis are innervated by this nerve.

The femoral artery which supplies the thigh and leg may be followed to the knee by a line drawn from the middle of Poupart's ligament to the adductor tubercle on the inner condyle.

The patella can be felt on the anterior of any knee, its tendon lying in a vertical plane. This tendon, a continuation of the extensor tendons of the leg, lies in the line continued through the tubercle of the tibia, drawn from the middle point of the ankle. The synovial sac lies beneath the patellar ligament one-

half its length, while it rises above the patella two inches, slightly higher beneath the vastus internus than the vastus externus.

The condyles of the femur and the tubercle of the tibia to which the ligamentum patella is attached are prominent points. The head of the fibula lies at the level of the insertion of the patellar ligament, on the outer side, the tubercle of the tibia on the inner side.

Ligaments of the knee.

The ligamentous structures of the knee are complicated and liable to injury. The external are the only ones which are palpable and their positions should be remembered.

The patella has been mentioned. The posterior extends across the floor of the popliteal space. The internal reaches from the tuberosity on the inner condyle of the femur to that of the tibia, being crossed by the inner hamstrings; the short external extends behind the external from the condyle to the styloid process of the fibula. Beneath the external lateral ligaments pass the external articulate vessels and nerves.

The nerves are from the external and internal popliteal branches of the sciatic, from the anterior crural and the obturator.

Its vascular supply is abundant and may be utilized in case of effusion around the joint. The tendons of

muscle around the joint are: The quadratus femoris, anteriorly; internally and posteriorly, sartorius, gracilis, semi-membranosus and semi-tendinosus which are inserted into the inner aspect of the tibia.

The biceps tendon is related to the external lateral ligament and is attached to both tibia and fibula, the ilio-tibial band passing anterior to it to be inserted into the head of the tibia. The popliteal space offers the point for effecting both superficial and deep drainage of knee and leg through the popliteal and short saphenous veins. Locking of the knee in extension is due oftentimes to shortening of these cords, sometimes due to misplacement of the semilunar fibro-cartilages of the knee.

Landmarks of the ankle.

The two prominent landmarks of the ankle are the two malleoli, the inner longer and lower than the outer. Back of the inner malleolus may be reached the posterior tibial nerve, a continuation of the internal popliteal, the posterior tibial artery and the short saphenous vein.

The anterior tibial artery and nerve lie between the tibia and the fibula anteriorly, passing beneath the annular ligament between the tendons of the flexor proprius hallucis internally and the flexor longus digitorum.

The tendons around the ankle are: The tendo-achillis prominent behind; external to this the two peroneii, while internal to it behind the inner malleolus we find tendons of the tibialis posticus, flexor longus digitorum and the flexor longus hallucis. On the front of the ankle are the four tendons which extend to the foot and the toes. The sciatic nerve innervates all the muscles of the leg and the foot through its branches or sub-branches.

The popliteal artery divides into the anterior and the posterior tibial an inch and a half below the popliteal space, the anterior passing between the bones anteriorly and the posterior continuing down the middle line of the leg.

In rheumatic affections of the knee or the ankle or in strains of these articulations the nerves must be carefully treated. The drainage must be watched in all cases in which effusion is a condition. This is secured by manipulation of the muscles, by pressure over the deep nerves, and by tracing the superficial veins, giving particular attention to the saphenous opening.

CHAPTER X.

GYNECOLOGY AND OBSTETRICS.

OUR race is entitled to a healthier motherhood. In eliminating drugs and substituting a rational method of treatment, Osteopathy has contributed much to this end. In pelvic, even more prominently than in other diseases, is the *rationale* of osteopathic treatment brought into view.

Hyperaemia a cause.

Take off the pressure. Remove the stasis. Replace and strengthen the organs. Nature will restore health and vitality if she have the opportunity. No matter what condition the disease of the pelvic organs may have assumed, there is too much blood there, for continued over-stimulation of the vaso-constrictors would soon result in a weakness of both nerves and vascular walls and a consequent engorgement. Always too much blood,—hyperaemia. This results in a stasis, but still too much blood. Moving blood is health. Stasis reduces the nutritive properties of the blood, creases its percentage of waste products, deteriorates

the vascular walls and produces transudation and œdema.

This increase of local fluid is an irritant to the nerve endings and the organs are excited to a condition of pain. This condition now results in a morbid metabolism, either constructive as growths, enlargements, and tumors; or to breaking down of tissue through retrograde metabolism, as in ulcerations.

In almost all cases of pelvic disturbances leucorrhœa is a preceding condition, an unmistakable sign of hyperæmia, venous stasis, and decreased vitality of vascular walls. This fluid should be returned by nature's conduits, the veins, designed to carry back the products of oxidation in the tissues. If there be pressure on the venous channels anywhere between pelvis and heart then will this exudation be present. But this pressure to the veins is not the only factor which may disturb the vitality of the pelvic organs. Closely related as they are with the sympathetic nervous system and with the cerebro-spinal both directly and indirectly, the pelvic organs are the servants of the nervous system. Any change in their positions may irritate an afferent nerve and reflexly interfere with their nutrition and function.

But this is not all. Any change that may occur along the pathway of these nerves will produce the

same effect. The pelvic organs are innervated by the nerves making their exit from the lumbar and from the sacral portions of the spinal canal, and from the hypogastric plexus lying over the body of the fifth lumbar vertebra. *Innervation of the pelvic organs.*

The nerves to the ovary come from the uterus along the Fallopian tubes while another pathway is from the ovarian plexus, derived from the aortic plexus, thus related to the lower portion of the solar plexus. The hypogastric plexus also receives fibres from the lower dorsal thus connecting these organs with the lower dorsal and upper lumbar spinal segments.

The arterial supply to the pelvic viscera is from the aorta via the ovarian and from the internal iliac via the uterine, drainage being effected into corresponding veins.

In position the uterus extends from fundus a little below the brim of the pelvis, slightly to the right of the middle line to the upper portion of the vagina into which the cervix projects, meeting it normally at a right angle or greater. The condition of the bladder and rectum will affect the position of this organ.

The Fallopian tubes extend from the highest point of the uterus laterally, lying below the level of the sacral promontory, enwrapped in the broad ligament. They are from three to five inches in length lying over and

around the ovaries. The latter bodies are about one and one-half inches long, one inch broad and one-half inch thick, and lie in the broad ligament. They lie just within the true pelvis at the side of the uterus and cannot normally be palpated through the abdominal wall. Their blood supply is derived from the ovarian artery, their nerves from the hypogastric plexus.

Examination. Examination of the pelvic organs can be made in many cases and cures be affected without a vaginal examination. This is often true in cases of young girls. The examination should first be directed to the spine in the following regions: the ninth to eleventh dorsal, the first to third lumbar, the lumbo-sacral articulation, the sacro-iliac synchondroses and the second and third sacral nerves.

In addition, the fifth lumbar is almost invariably affected, either primarily disturbing the hypogastric plexus or reflexly from it.

For a local examination the patient should be on her back, the legs flexed. The body of the patient should be covered. For examination the hand should be carefully cleaned and rendered aseptic, and slightly coated with some non-irritating substance. Should it become necessary to examine a virgin the greatest care must be taken to avoid rupturing the hymen. Often an imperforate hymen may be the cause of trouble.

The left hand should be used to depress the uterus through the anterior abdominal wall. Carefully notice the position of the uterus. In ordinary cases the index finger should, without force, reach the uterus as it extends into the vagina. Should it be too close to the vaginal entrance there is prolapse. The direction of the os and cervix will determine whether the uterus is tipped anteriorly, posteriorly or laterally; called anteversion, retro-version and latero-version.

Should the fundus be bent upon the cervix the corresponding *flexion* prevails. An examination with speculum and sound is often necessary.

Should any of these conditions be present it is an indication of the presence of too much blood of an inferior quality. Pain and irritation have called too much blood to the parts; stasis has caused its quality to deteriorate. Local applications are useless. Pessaries and supports are in no sense correctives. The treatment consists in correcting the disturbances in some of the following locations: The muscles, ligaments and vertebræ in the lower dorsal and lumbar regions should be made normal. An inpacted sigmoid and rectum may cause trouble to the uterus itself or to the hypogastric plexus. Overcome constipation and in many cases the cure is effected. Remove the pressure of the abdominal viscera, prevent lacing, cause

Treatment.

patient to stand and sit with spine straight, thorax forward and abdomen drawn backward. Control of the lower portion of the abdominal parieties so as to exert a constant lifting force on the abdominal contents will prevent many diseases and overcome the incipient stages of all.

The pudic nerve should be stimulated as it passes over the spine of the ischium. This nerve supplies most of the perineal muscles. By maintaining their tonic condition the vaginal walls are suported, thus keeping the uterus in place. Relaxation of the perineum tends toward prolapsus.

Good effects are secured by drawing upward the pelvic portion of the abdominal wall. This is done while the patient is lying on her back, the legs flexed; or by drawing the viscera forward, the patient occupying the genu-pectoral position. Ordinary cases of displacements may be cured by the preceding movements. A very efficient treatment for misplacement is to insert two fingers into the vagina, the patient in the genu-pectoral position, the abdominal viscera pushed forward, then spread the fingers so as to admit air to the vagina. The pressure of the atmosphere will usually replace the uterus. The patient should remain quiet for some time after the treatment. Stimulation of the

round ligament is useful should there be retro-flexion or retro-version.

Coccygodinea should be treated by removing any irritation to the coccygeal nerve ; and by quieting the coccygeal gland. A dislocated coccyx may give much trouble of this nature.

Metritis is treated through the lumbar nerves and the hypogastric plexus. The pudic nerve is always to be treated in cases involving the vaginal walls.

Ovaritis is often relieved at the lower dorsal or first lumbar through correction of osseous dislocation. Dysmenorrhœa can be relieved and cured by correction of these lumbar and lower dorsal vertebra, and the sacro-iliac synchondrosis, together with the correction of any uterine displacement. Amenorrhœa is relieved by building up the respiratory, circulatory and alimentary systems; by spreading the lumbar vertebræ with a "figure of eight" motion; and in addition by striking your left hand, laid across the patient's sacrum, sharply with your right closed fist. This is a powerful stimulant.

Development of embryo.

The fœtus is formed as the result of the union of matured male and female reproductive cells, either within the uterus or the Fallopian tubes. Segmentation rapidly takes place, forming the blastoderm. A triple layered arrangement of cells prevails for two

weeks, at which time the stage of the ovum is succeeded by the stage of the embryo, lasting until the fifth week. The remaining weeks of pregnancy are called the fœtal stage. The formation of the neural folds and the notochord begins at the end of the second week. Up to this time the ovum has absorbed its nourishment from the lymph of the uterine mucous membrane. Now the development of the membrane begins. First the amnion, the innermost layer, is formed from the ectoderm and from the mesodermal layer of the embryo. Outside of the true amnion the false amnion is formed by the reduplicature and fusion of the laminæ of the true amnion. The allantois develops from the hind gut and serves to connect the fœtus with the placenta.

Origin of placenta.

By its development the allantoic tissue unites with the outer or false amnion, serving to form the embryonal portion of the placenta, uniting with the uterine or maternal portion which is developed from tissue of the mucous membrane of the uterus. There is thus a double origin for the placenta. The sac of the allantois with its amniotic wrapping is the forerunner of the umbilical cord which connects the fœtus and the mother through the placenta. The placenta receives blood from the uterine arteries of the mother which have been increasing from earliest pregnancy. It is

drained back to the maternal circulation by the uterine veins. The umbilical veins, later veins, begin in the fœtal portion of the placenta and absorb through their capillary walls the pure blood brought thither by the uterine arteries; the blood thus passes to the fœtus, entering its venous circulation, the portal vein and the inferior vena cava. The placenta receives impure blood from the hypogastric arteries, constituent parts of the umbilical cord.

Thus the nourishment for and the excrement from the fœtus must be carried through the maternal vessels.

The fœtus during the first three months is largely head, assuming the human form during the ninth to the eleventh week. At five months the heart, liver and head are alike very much developed, while movements are now felt. The vernix caseosa is formed by the sixth month and is completed by the eighth.

It is safe to assume that a woman apparently well formed will come safely through childbirth, so it is not necessary to examine the pelvis unless there is a deformity or a rachitic history. But there are certain precautions which every woman should take during pregnancy. Diet, of fruits and cereals, outdoor exercise and baths are conducive to an easy delivery and a perfect child.

When called the physician should carry with him a cool head and willing hands. In addition he should have a case containing tablets of mercury bichloride, shears, surgeons' cotton, a roll of clean muslin, a sponge and a spool of silk thread.

Essential Preparations.

Uncleanliness and untidiness in a case of this kind is a crime. The expectant mother should first be given a sitz bath carefully cleansing the perinæum. Then the hand of the operator after a thorough scrubbing with soap and water should be held in a bichloride solution, 1 to 1,000, for a few minutes and then an examination of the patient should be made. The hand should be thoroughly cleansed and rendered aseptic previous to each examination. This must never be disregarded.

The bed should be prepared by placing either oil-cloth, rubber or a layer of newspapers beneath the sheet. The perinæum and vagina should be thoroughly relaxed. Pressure upon and manipulations of the perineal body will produce a very satisfactory result. The dilatation of the os may be very much hastened by passing the finger, thoroughly aseptic, around the edge of the os, also by pressure on clitoris and on round ligaments. This will lessen pain. To reduce the pain press on either side of the spine in the lumbar region, fourth and fifth, and in the eighth

to tenth dorsal; this does not retard the progress of the case. Should the pains and the expulsive movements of the uterus become tardy, stimulation in the lumbar region may be very effective. Relaxation of the round ligaments as they pass over the pubic crest will allow the uterus to protrude further into the canal of the vagina. Steady pressure at the symphysis pubis will also aid in relaxation of the parts and reduction of pain.

Manipulations that aid in child-birth.

Should the child be large and the labor difficult it is well to guard the perinæum by holding the hand against the perineal body, thus guiding the infant through the vaginal opening. Push the tissues from the symphsis toward the perineal body.

As soon as the head is born examine to see if the cord be around the neck. If so, loosen and follow it with the fingers, one on either side, within the vagina to protect it from occlusion. In foot presentation the body should be wrapped in cloth or cotton to protect from the air until the head is born. The cool air against the skin may stimulate the respiratory center, causing the child to breathe.

As soon as the child is born, open its mouth, cleanse the mucous passages until it has given a good cry, then keep it covered and wait until the pulsations have ceased in the unbilical cord. Now draw the cord

between the thumb and finger toward the unbilicus and tie with a clean thread about two and one-half inches from the infant's navel, tie again an inch further out and snip the cord between these points.

If the placenta has not yet been delivered, gentle traction on the cord may produce it. The mother can usually assist by an expulsive movement, as coughing or blowing into the closed hand. There is no need to hurry in this matter, an hour may sometimes elapse before the placenta is passed. In case it is not easily secured pressure on the abdominal wall above the pelvis may secure it. Place the palms flat upon the walls and press forcibly downward. Do not insert the hand into the uterus unless necessary. If the hand is inserted, be sure *that it is aseptic.* Pass the fingers between the placenta and the uterine wall, the air entering will often release it. If this is not sufficient, gently force it from the wall of the uterus.

How to obtain the placenta.

After the delivery, if there has been no laceration and no cause to suspect infection, the external genitals should be carefully cleansed, the vulva protected by a cloth fastened as the napkins are usually fastened. Between the napkin and the vulva should be a pad of surgeon's cotton. Should there be post-partum hemorrhage it can be checked by stroking sharply, with cold hand, the mons veneris.

Antiseptic injections

The uterus must be reduced to contract the vessels and close the sinuses. This is done by gently working the fundus through the abdominal wall. This will reduce the intensity and the number of the after-pains and shorten the lying-in period and prevent hemorrhage.

The mother should, after being made scrupulously clean, be left to sleep. Rest is the great restorer. The nurse should be instructed to carefully cleanse the external genitals with soap and water, following with a solution of bichloride of mercury, 1 to 2,000. Should it be deemed necessary to use an injection a perfectly sterile pipe must be used, having been dipped in boiling water, both tube and pipe having been left in a bichloride solution of 1 to 1,000 for ten minutes. The injection may be 1 to 4000 bichloride or creolin 1 to 100 (1%).

Care of the breasts.

The nurse should be given explicit directions as to the care of the patient, The breasts should be watched carefully. A scanty secretion of milk may be increased by a separation of the upper five or six ribs, lifting scapula, and freeing the subclavian and axillary arteries. This affects the internal mammary branches which supply the mammary gland. It also stimulates the intercostal nerves in this region. We spread the ribs increasing the blood supply through the

perforating arteries, and giving a perfect drainage through the veins. The internal mammary artery may be reached at its origin from the subclavian, producing effect through the plexus derived from the subclavian and from the inferior cervical ganglion. Let me repeat that the introduction of the hand into the uterus to take the placenta is the most dangerous part of child-birth. It should be done only as a last resort.

CHAPTER XI.

CONSTIPATION, RHEUMATISM AND CATARRH.

OCCUPATION, diet, the drug habit, irregularity in the time of defecation, morbid secretions of liver and pancreas, osseous lesions and general neurotic conditions, are causes of constipation, while this may in turn be the cause of anæmia, neuritis, menstrual disorders, poor circulation, piles, hæmorrhoids, etc. The normal time for evacuation is once per day though it may vary from this, twice a day being perfectly natural with some and once every second day being in many cases normal.

The condition is massing of fecal material in the lower bowel,—usually the descending colon and the sigmoid. A preceding atony of the colon, particularly the musculature of the sigmoid, is frequently an obstinate cause. That constipation so frequently follows peritonitis and fevers is a suggestion of a very common cause, viz.: inflammation with its consequent engorgement and stasis.

Cause and effect of impaction.

The presence of fecal matter within the intestine should lead to a normal peristalsis, — when the nerves are no longer stimulated by such a condition, or when the muscles fail to respond to such stimulation, then costiveness results. If normal peristalsis occurs above while there is sluggishness in the lower portion of the tract, then impaction must occur. This impaction may occur at the hepatic or splenic flexures, or in the left inguinal region, extending down into the sigmoid and the rectum. In case of such impaction the masses must be broken up and removed before the treatment directed toward restoring tonus to the musculature and health to the mucosa can be effective.

The blood supply is from the superior and inferior mesenteric arteries to the colon and sigmoid, while the rectum receives its supply from the inferior mesenteric, the internal pudic, the sacra media, the sciatic, and, in the female, the vaginal.

The innervation of the lower bowel is from the vagus, lumbar and sacral, — the vagus supplying the alimentary tract as far as the sigmoid while the lumbar and sacral are inhibitor and augmentor respectively to the remainder. The lumbar are, in addition, vaso-constrictors through their rami communicantes, while their secretory fibres must control the flow of the intestinal juices. The sacral

Innervation of intestines.

nerves distributed directly to the pelvic organs are the vaso-dilator and also viscero-motor to the large intestine. The lower portion of the rectum receives fibres from the inferior hæmorrhoidal, a branch of the pudic.

In treatment of this condition the patient must yield strict obedience to directions. Few things are better than outdoor exercise.

The normal number of nerve impulses should be sent along the nerves of the abdominal muscles, the muscles of the thigh and the hip in order that the proper amount of impulses reach the lower portion of the intestinal tract, which is innervated by nerves originating in the corresponding segments of the cerebro-spinal axis. Physiological nerve impulses passing along the lumbar and sacral nerve trunks, both afferent and efferent, cannot but favorably affect the splanchnic fibres from the same nerves distributed to the viscera within the abdominal and pelvic cavities. Any form of physical exercise involving the use of the muscles of the abdomen and thigh will thus be beneficial to this particular condition.

See that your patient uses water freely; few people drink enough. The lower bowel is the great dessicator; but, should the fecal mass contain but little fluid this will all be taken, and a dry and hard resistant mass will remain to irritate the intestinal mucosa

Water of value.

until finally it fails to respond to such irritation. Then sets in an atonic condition of the bowel, due to its over-distention by the continual crowding down from above the material left from each meal. Three pints of water per day is necessary, and more than this amount if much is taken from the system by perspiration. This water is a stimulus to the circulation and to the liver, and an incalculable benefit to the kidneys.

The osteopathic treatment for constipation is based upon the anatomy and physiology of the bowel and its contributory glands. The liver, by its contribution of bile, is one of the most important organs in the work of the bowel. Its bile is beyond doubt the normal stimulus to peristalsis. Thorough change of blood within the substance will overcome the stasis of blood and reduce the resistance "a fronte," thus facilitating the drainage from the entire alimentary canal from stomach to rectum. This reduction of stasis will of itself overcome plethora of venous blood within the mesentery, meso-colon, meso-sigmoid and meso-rectum.

Venosity of blood is itself a cause of excessive peristalsis, should the venosity be introduced suddenly, but when it comes gradually as the result of a decreasing activity of the liver then it leads to atony

of the walls, sluggishness, impaction and the various attendant conditions of constipation. Hence to relieve constipation, stimulate the liver to activity by treating directly over the walls of the abdomen and thorax beneath which it lies. A stimulation along the line of the hepatic artery, pressure against the gall cyst, the patient making the greatest expiratory effort with the thighs flexed upon the abdomen, will be effective. Separation of the ribs by the aid of the serratus magnus and latissimus dorsi, and correction of any osseous lesion that may exist near the ninth or tenth dorsal will restore the liver to normal function.

Treatment.

In addition to this treatment of the liver the bowel must have especial attention. The major portion of the large intestine and all of the small intestine receive their secretory, trophic, vaso-motor, motor and inhibitory nerves via the solar plexus. Through their endings these fibres may be reached at any part of the abdominal parieties anteriorly or in the splanchnic region of the spine.

The colon, sigmoid and rectum must first be cleansed from any impacted feces. The colon should be carefully kneaded. By such action the end fibres of the pneumogastric nerve may be stimulated, thus increasing peristalsis. The secretory fibres in the

plexus of Meissner are also stimulated, thus tending to restore the normal condition.

Lesions in constipation.

The lumbar region will usually show lesions in constipation. These may be osseous, and if such will be corrected, each case demanding its own treatment. In case of muscular contracture which has cut off the nerve force to the part, then such contracture must be reduced. This will usually be found to be in the region of the quadratus lumborum. This muscle may be stretched by a bias stretch, placing one hand on the iliac crest, the other on the lower ribs at or near their angles, the patient lying on his side with face toward the operator. Drawing the ribs toward him and the ilium from him, and then reversing the movement the operator is enabled to accomplish a thorough reduction of this muscle. The psoas muscles lying in contact with the ascending and descending colon and also containing, as it were, the origin of the lumbar plexus, is an important factor in osteopathic manipulation for constipation. It is attached to the lumbar and to the last dorsal vertebræ, and is inserted into the lesser trochanter. Flexion, rotation and circumduction of the thigh will affect this muscle which will in turn influence the lumbar plexus. Good results are obtained by placing patient on face and strongly raising the legs.

The sacral nerves are the motor nerves to the descending colon, the sigmoid and the rectum, and their stimulation will increase the movement of that portion of the canal.

The pudic nerve.

There is often soreness in this region, showing need of stimulation to these nerves. The pudic nerve which sends its inferior hæmorrhoidal branch to the rectum may be reached at the ischio-rectal fossa. This nerve should not be overlooked in constipation as it often has an important effect on this condition when due to rectal enervation.

The sphincters should also be carefully examined as it may be that they are so contracted as to prevent the passage of the feces. The finger well covered with vaseline is a good dilator. After the insertion of one, two should be inserted and then forceful separation serves to overcome the contraction of the sphincter. The finger should carefully examine the rectal walls for prolapsus, growths or hæmorrhoids.

The coccyx should be examined, as it is often thrown forward, acting as a physical impediment. It can be replaced by passing the finger above and in front of it and drawing downward, thus extending it upon the sacrum. The ganglion impar, situated on the anterior surface of the coccyx, is easily reached per rectum and its stimulation serves to increase the

activity of the sympathetic nerves regulating the circulation and the alimentary systems.

The sigmoid is often more or less prolapsed in case of constipation. This can be raised by traction in the iliac region through the abdominal wall, the patient lying on side, the operator standing behind, the legs being slightly flexed in order to loosen the abdominal wall. Should the vertebræ be posterior the patient may lie on side and the operator first exaggerate the condition by curving the lumbar spine, then pressing upon the prominent spines while returning the spine to the normal condition. The patient may lie face downward, after thorough and complete relaxation, and the operator put sudden pressure upon the spines. This is very effective, though care must be used to avoid violence.

The patient seated on a stool is in a position of advantage. Sometimes it is helpful to have the patient lie obliquely across the table and then put an auger twist upon his legs. In addition to these treatments the quadratus lumborum must be relaxed and the thighs flexed and rotated outward so as to call into activity the psoas muscle. Separation of the knees against the muscular resistance of the patient is of value.

RHEUMATISM.

The term rheumatism does not carry with it any definite idea of either cause or symptoms. Manifesting itself by pain, with or without swelling, it interferes with the use of the muscles, enlarges the bones at their articular portions, and by stasis of blood stiffens the ligaments, tendons and connective tissue until from proliferations and shortening of the fibres motion is more or less completely lost. This may affect one articulation or may involve the entire body. The presence of lactic acid or its isomeric form in the blood in this disease has led to the belief that it is one of the primary causes of the disease. Though often present it does not follow that lactic acid is a cause of the disease, but would rather suggest it as a result. The fact that the disease may confine itself to one or to a few articulations would indicate that there are other factors involved. Our system of therapy teaches that every organ or member will function properly if its structure be perfect and the natural nerve impulses be unchanged. *Symptoms.*

That a single tissue or organ may be the seat of rheumatic affection points unmistakably to a weakened power of resistance on the part of that tissue or organ, or else to what is the same thing, deficiency in nourishment or to a failure in impulses reaching it

Ettology.

from the nervous system. That there are disturbing elements in the blood cannot be doubted. That they are the result of failure of the assimilative tissues, increased by a disturbance of the harmony existing between katabolism and excretion, seems certain. This, then, will attribute the trouble to the *liver* on one hand and to the *kidneys* on the other. The respiratory power may be at fault, leading to retarded oxidation and to the formation of suboxides. The change in the functioning of the liver interferes with the character of the blood, thus involving the heart and interfering with the circulation.

Our treatment is directed to the nervous system to re-establish the proper control of the disturbed organs.

In all cases the diet must be carefully selected; cereals, little meat and a reduction of the carbohydrates will aid in overcoming the acidity of the blood and in resting a disturbed digestive tract.

As an adjunct to other treatment the patient should be required to drink freely of hot water. This serves to flush the sewers of the body, thoroughly cleansing the capillaries and washing the detritus from the tubules of the kidneys.

In case of muscular rheumatism affecting one muscle or a group of muscles, look for a lesion at the exit of the nerve which supplies that region.

Pressure upon the nerve, either at its emergence or along its course may be the cause of the condition. This frequently disappears after a single treatment. Remove the cause and torticollis, lumbago and similar forms disappear.

The mono-articular type, whether chronic or acute, is in most cases a result of a local injury. Correction of this lesion will be followed by cure.

In cases affecting the lower limbs the three points to be noticed most carefully are the tissues around the exit of the sciatic nerve, the saphenous opening and the lumbar spine. In case the upper limb is affected the points to be most carefully scrutinized are the cervical vertebræ from the fifth to the eighth, the interscapular area and from the second to the sixth dorsal and the brachial plexus.

Treatment.

In all cases the spine must be corrected, stretched and relaxed. All lesions in the region of the liver, seventh to tenth dorsal, must be corrected. These may be lesions of bone or of muscle.

The kidney region, eleventh dorsal to first lumbar, must have the same care in order that the excretion may be thoroughly accomplished The entire splanchnic area must be stimulated to activity. The various nerves affected must be freed from pressure their entire length so as to overcome stasis in their blood supply.

In case the hands and feet are affected treatment must be given each articulation to maintain and secure mobility. While the nerves are hypersensitive, causing a chronic shortening of the flexor muscles, it is of value to thoroughly knead the muscles to secure their relaxation. Stretching the muscles will prevent such contracture or will correct it if present. In case of œdema the effusion can be removed by pressure and movement directed toward the venous flow. Acute attacks should be treated two or three times each day. Hot baths are valuable adjuncts to the treatments, though care must be used to avoid taking cold.

CATARRH.

In considering the various forms which this disease may assume it is well to consider the primary changes in the mucous membrane with which it is associated. There is always an initial dilatation of the blood vessels due to an inhibition of the local vaso-constrictor action. This results in an increase of capillary pressure, venous stasis, transudation of lymph, œdema and discharge. This discharge at first is thin and watery but soon changes to greater consistency.

It may be acute (coryza), chronic (rhinitis), seasonal (hay fever). This catarrhal condition may affect the mucous tract anywhere. Our treatment for it is as

follows: Secure a thorough drainage of the catarrhal tract by removing any stoppage to the veins from the part. Begin this by thorough relaxation of the following muscles of the neck: the platysma, sterno-cleido-mastoid and the more deeply lying infrahyoid group, the scaleni, the recti capiti and the longus colli. This treatment should now be followed by a thorough relaxation of the muscles in the upper dorsal region including the muscles connecting trunk, neck and occiput.

Treatment of catarrh.

A thorough stimulation of the superior cervical ganglion will reduce the venous stasis while a stimulation of the cardiac center in the upper dorsal region will result in sending blood from the mesenteric reservoir of capillaries to the cutaneous surfaces, relieving the mucous congestion, equalizing the general pressure and at the same time furnishing the congested membrane with a fresh supply of pure blood.

The nutritive fibres to the muscles of the face are transmitted by the seventh nerve. This may be treated by relaxing the tissues around its exit as it traverses the space between the stylo-mastoid foramen and the ramus of the inferior maxilla.

The sensory and trophic distribution to skin of the face and mucous membrane of catarrhal tract is through the fifth, ninth and tenth nerves. These

nerves are treated as follows: Pressure on the fifth nerve at its points of emergence on the face will quiet the sensory nerves and bring blood to the surface. Downward pressure over the carotid sheath will reach the tenth nerve and at the same time assist in drainage. The ninth nerve is reached as it leaves the jugular foramen, also on the tonsils internally, in case it affects the Eustachian tube or the middle ear.

The first, second and third cervical are often at fault in this trouble.

CHAPTER XII.

HOW AND WHERE.

(A few practical hints for emergencies.)

IN case of eye trouble, inflammation, pain, etc., not due to the presence of a foreign body, treat the fifth nerve at its terminal portions around the orbit; the superior cervical ganglion, which through the carotid and cavernous plexuses is distributed to the eye and to the parts surrounding it; the first and second cervical vertebra; the upper dorsal, the latter being the exit of the fibres going to the eye. Pressure on eye for muscles of orbit and for ciliary ganglion on fifth nerve.

Ear: The ninth nerve for the ramus tympanicus; the auricular branch of the tenth; the auriculo-temporal from the inferior maxillary of fifth; the small occipital and the great occipital; the ninth for deafness and ringing in the ear; the cervical and the auriculo-temporal for earache. Relax the opening of the

Eustachian tube in pharynx; the second cervical vertebra is often a disturbing factor.

Thyroid Gland: Over gland itself, following veins, at middle and inferior cervical ganglia, raise the clavicle; correct first rib. Fifth and sixth cervical vertebra.

Bronchial Tubes: The upper three ribs; relax the intercostal muscles; relax the muscles in the corresponding spinal segment; raise the ribs.

Lungs: Treatment much the same as for bronchial tubes, extending lower to ninth.

Heart: Quiet it by steady pressure at annulus of Vieussens. Raise fifth rib; separate ribs on left side; hold vaso-motors; correct lesion in upper dorsal region; inhibit solar plexus to equalize circulation.

Larynx: Tenth nerve; superior cervical ganglion.

Tonsils: Treat by stimulating superior cervical ganglion; by working over their mucous covering; by treatment at exit of ninth and tenth nerves.

Headache: Work downward over carotid sheath to aid in drainage; to check blood supply bend back head, pressing tightly against vertebral artery; steady pressure on great, small and suboccipital nerves at basi-occiput; steady pressure on filaments of fifth nerve; look for uterine or ovarian trouble; stomach fre-

quently at fault; press on solar plexus. In anæmic headache stimulate heart action.

Liver: Relax at ninth and tenth; vibrate the liver; treat over solar plexus; reach gall cyst under ninth costal cartilages on right side; knead liver.

Stomach: Pressure at third and fourth dorsal on right side; osseous lesions, third to fifth; quiet vomiting, pressure at angle of third to fifth ribs on right; elevate the ribs.

Small intestine: Reach mesentery through mesogastric zone; solar plexus back of stomach; in middle and lower dorsal.

Large intestine: Flux and diarrhœa; patient on face; strong pressure on each side of spines in lumbar region; lift legs while pressing, springing spine forward.

Enuresis: Look for trouble in middle lumbar; sometimes lower; examine clitoris in female, glans in male for irritation; examine urine for cystitis; correct spinal lesion; examine for phimosis, vulvitis, worms.

Croup: Loosen the tissues of the neck, giving especial attention to the deep muscles; work on superior cervical ganglion; follow veins and lymphatics for drainage. Stimulate in dorsal region.

Sciatica: Lesion is usually in lower lumbar; often a contraction of pyriformis causes it; stretch this and

other external rotators by turning thigh inward, pressing on structures closing the greater sacro-sciatic notch; follow nerve to knee, relaxing the structures; flex leg on thigh and thigh on pelvis, then with thigh flexed extend the leg. This will effectually stretch the sciatic nerve.

Toothache: Press on branches of the fifth nerve, either at infraorbital or just below malar bone, over spheno-palatine ganglion beneath the zygoma, and near the articulation of inferior maxillary.

Fainting: Leave head low; stimulate heart to action through the inferior and middle cervical ganglion. In case of prolonged unconsciousness the fingers inserted into the rectum, briskly stimulating the ganglion impar, will usually be effective. Stimulate the suboccipital region.

Anterior upper dorsal: Cross patient's arms in front, stand behind. Pull on wrists and push outward and forward on scapulæ. An assistant is necessary for this work.

Epistaxis: To stop bleeding stimulate superior cervical ganglion. Press on nose at inner canthus of eye.

Rigors: Strong stimulation in dorsal region. Stimulation of inferior cervical ganglion. Strongly stimulate liver. Stimulate solar plexus. Increase respiratory activity. Loosen contractures in cervical region.

Epileptic convulsions: Hold strongly on suboccipital region, pressing head backward. Relax the muscles in upper dorsal.

Cramps and clonic spasms in women attributable to uterine irritation: Inhibition in lumbar region and the round ligaments; sometimes replace uterus.

Hiccoughs: Inhibition of the phrenic over the third, fourth and fifth cervical. If severe, treat splanchnic area.

Tormina: Inhibit lumbar nerves and solax plexus.

Tenesmus: Inhibit over sacrum.

Depressed rib: Use arm as lever and while pulling upward and backward with one hand, press strongly at angle of ribs with other, maintaining the pressure until the arm is returned to a position of rest.

Patient may lie on side or back, or may sit for this treatment. The knee may be placed against the vertebra, operator then using both hands.

First or second rib elevated: Place thumb of one hand on head of rib. Draw hand in opposite direction so as to tighten scaleni muscles, then pressing downward on rib rotate the hand and draw back toward affected rib. This will slip rib into position.

Eleventh and twelfth rib elevated: Stretch quadratus lumborum and push downward on angle of depressed rib.

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